

MAR 13 1923

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Vol. XLVIII
Number 10

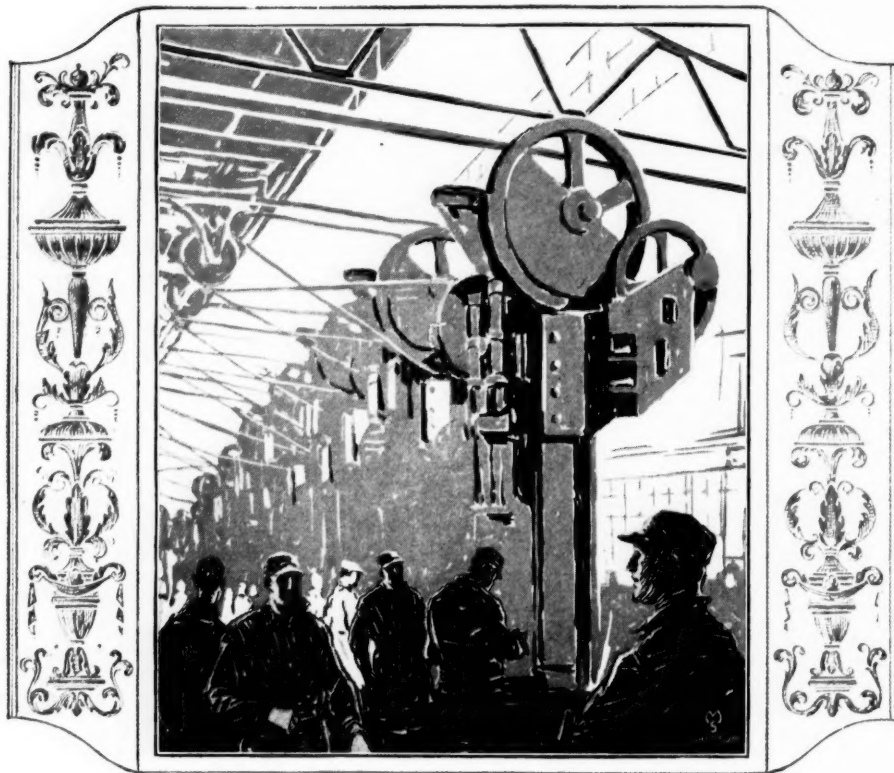
PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, MARCH 8, 1923

Thirty-five cents a copy
Three dollars a year

Not only *Radial* loads—
Not only *Thrust* loads—
But *Radial Loads and*
Thrust Loads and Result-
ant Loads. Their "*dual*
service" ability is one
of the big reasons behind
the dominance of

TIMKEN

Tapered
ROLLER BEARINGS



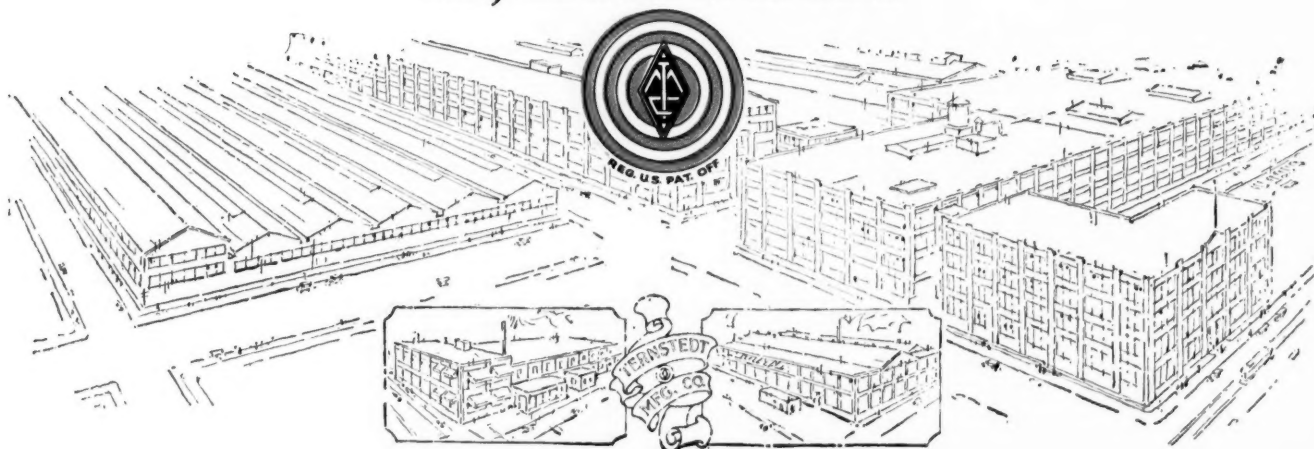
Production

Batteries of huge presses—hundreds of screw machines and lathes—immense enamelling ovens—plating baths—die-casters—rolling machines—and a vast amount of specially designed equipment—are in constant action at Ternstedt. For tons of raw materials must be daily transformed into accurately finished appliances. Manufacturing schedules must keep pace with an enormously increasing demand. Yet, so well organized and so great is the scope of Ternstedt production facilities, prompt fulfillment is always assured. Promises are kept. Deliveries are certain and on time.

TERNSTEDT MANUFACTURING COMPANY
6307 West Fort Street Detroit, U. S. A.
Division of Fisher Body Corporation

TERNSTEDT

*Largest Manufacturers of Automobile
Body Hardware in the World*



AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLVIII

NEW YORK—THURSDAY, MARCH 8, 1923

No. 10

First Omens, Warning of Inflation, Appear on Horizon

While present business is highly satisfactory, most commodity prices are rising steadily. Automotive manufacturers bidding against each other for steel. Tire makers compete for labor. Nothing to worry about if caution is exercised.

By James Dalton

BUSINESS in general is moving ahead at high speed. Order books are full and demand seems strong all the way down the line to the ultimate consumer. Unemployment has reached a minimum and the boys are making another pilgrimage from the farm back to the factory. Even clerical help is getting scarce. Bank vaults are piled high with cash. Collections range from fair to good. Frozen credits are being thawed. Prices are going up, although they are a good deal lower than they were at the peak. The export outlook is bright except for Central and Eastern Europe.

Month after month of wonderful business has rolled by for the automotive industry. For nearly a year the men in it kept saying, "This month is good but we don't know what will happen next month." It began to sound like a cry of "wolf! wolf!" when

there was no wolf. Caution begot confidence. Instead of talking about one month now they are looking ahead a full half year. Business is so good little is to be gained by talking it over with the neighbors.

BUSINESS is so good there seems little need for scanning the business horizon in a search for clouds, but a few fleecy banks already are forming and they may bring rain. Conditions in some respects parallel those which existed early in 1920.

Steady increases in commodity prices may presage runaway markets. Automobile makers are offering premiums for steel and tire manufacturers are bidding against each other for labor. If prices go too high they will bring another of the dreaded "buyers' strikes."

The general expectation is that 1923 will be the best year in the history of the industry, and it may be.

There are only a few fleecy clouds on the business horizon, BUT—

These clouds may roll together and bring rain. Those who are wise in the ways of the skies will have no difficulty in finding safe shelter, but those who aren't may get wet.

Executives of automotive manufacturing companies would do well to take a day off from all

their other duties and take stock of the economic conditions which now prevail. They undoubtedly are very busy men, but it is difficult to imagine how they could spend the time more profitably if ultimate prof-

its are considered and they are all which count in the long run.

We mentioned last week the warning signals hoisted by the Federal Reserve banks of New York and Boston when they raised their rediscount rates. This caution is all inclusive, but there are other factors which apply to the automotive industry in particular.

The situation today is practically identical with that which existed at the beginning of 1920, although nothing comparable in severity can result. Sales are heavy and there apparently is no limit to the demand for individual transportation. To meet this demand some of the larger producers are bidding against each other for labor and materials. In the materials field this condition applies particularly to steel.

SEVERAL automobile makers have offered substantial premiums over the current market price for immediate deliveries, especially of sheets. Other consumers contend that this is demoralizing the market. The market for all kinds of steels is exceedingly strong and prices are steadily rising. There is a feeling that, encouraged by automotive purchasing agents, steel manufacturers may be overplaying their hand. The steel people contend, on the other hand, that their prices are only a very little above the average in the general commodity list.

It must be said, in all fairness, that a few of the leading motor car makers are sitting tight and playing safe in this respect.

A long memory is not required to recall conditions early in 1920. Sleeping cars and the waiting rooms of all kinds of plants were filled with "stock chasers" representing automotive companies. Other industries placed upon them most of the blame for rapid price increases at that time and they unquestionably were partly responsible.

In the last analysis it was extortionate prices which caused the cessation of buying and the collapse of values only a few months after the peak of a period of unprecedented prosperity. The country is running into a somewhat similar situation. Prices of motor vehicles have not been advanced, but if the industry is responsible to a considerable degree for higher prices for the commodities it uses, it is lending itself to the same general result. Only about 10 per cent of the total steel production goes into motor vehicles, but the industry exerts a very great influence on prices. It stabilized the market when it sadly needed stabilization and it can demoralize it even more easily.

General prices have more to do than anything else in determining wage rates. When they rise beyond a certain level labor demands higher pay. If its demands are not accepted voluntarily, strikes are called to enforce them where workers are well organized. The iron and steel industry expects that another wage increase will be necessary in the near future.

The big tire manufacturers at Akron have granted their employees a 10 per cent "bonus," which is nothing more than a higher wage, and again are bidding against each other for labor. This is the result of an unprecedented demand for tires at a time when cotton and crude rubber prices are going higher constantly. The inevitable result, if present conditions continue, will be higher

prices for tires at retail, unless profits are sacrificed.

Railroad workers are discontented. If the cost of living keeps going up many of them are likely to strike for higher wages. If they do, the result will be serious. All claims to the contrary, the railroads have not by any means recovered from the effects of the shopmen's strike and rolling stock is not in normal condition. No prophet's vision is needed to forecast the result of a strike when transportation facilities are entirely inadequate under the most favorable conditions.

Prices determine the volume of buying. They run around in a vicious cycle. If demand is strong, they go up, leading to inflation and speculation. If they are low they bring depression and deflation. No one seems to be content with a reasonable middle ground, which means moderate prosperity.

It has been the history of economics that every prolonged period of rising prices provoked speculation and has been followed by a period of equally drastic deflation. This has been followed by a secondary period of inflation, with rising prices, and this in turn by a secondary period of deflation, after which the country generally settles down to moderate prosperity for a considerable length of time.

Other omens are not lacking, in addition to rising prices and a scarcity of commodities. The stock market is going through an era of speculation, bond prices are uncertain, newspapers carry pages of advertisements announcing new security issues, the list of new incorporations is steadily growing and business troubles are decreasing in number. Some of these factors are highly gratifying, but they all point to inflation.

Obviously, however, nothing which can happen can be comparable to the collapse in 1920 for the simple reason that the financial situation is immeasurably better. Comparatively few substantial companies are over-extended and bank reserves have again reached a high level. Speculation is confined to a comparatively few lines. If there is a cessation of commodity buying it will not be as far reaching or as prolonged as that which began in 1920.

Nothing untoward need be expected for four or five months at the earliest. There need be no serious slackening at any time this year if the temptations toward over-speculation and over-extension are resisted.

THE automotive industry is in a peculiarly fortunate position and if it is caught in a jam it will have only itself to blame. There is a very strong demand for its products and there always will be. Manufacturers have liquidated most of their bank loans and the larger companies are in a strong cash position. Inventories are of moderate size and they are fairly well balanced. Stocks of finished products are small. Merchandise accounts are on a current basis. Neither accounts payable nor receivable are out of proportion. Dealers might welcome a breathing spell which would clear up the used car situation. Prices are not inflated. They were reduced to a practical minimum and have been kept there.

Much of this does not apply, of course, to those companies which have been hanging on the ragged edge since 1920, hoping against hope that they could get through.

"IN respect to the prices of their products, automotive manufacturers have displayed much sagacity since the fall of 1920. They are in a stronger position with the public today than men in almost any other industry. They can remain in that position unless they force themselves to raise their prices by bidding against each other and thus forcing up the cost of the materials they use and the labor they employ."

The pity of it all is that there is no real need for inflation and the inevitable deflation except the weakness of human nature. When sales are good, producers of all kinds of commodities are not content with a reasonable business. They go on forcing sales. In the case of most commodities, producers make the price all the traffic will bear. They keep boosting it higher until the public balks. Then it goes down, willy nilly.

In respect to the prices of their products, automotive manufacturers have displayed much sagacity since the fall of 1920. They are in a stronger position with the public today than men in almost any other industry. They can remain in that position unless they force them-

selves to raise their prices by bidding against each other and thus forcing up the cost of the materials they use and the labor they employ.

Many passenger car makers have not displayed quite the same degree of wisdom in respect to production for it must be confessed that they have been forcing sales a bit since the wonderful demand for their products came to life again just about a year ago.

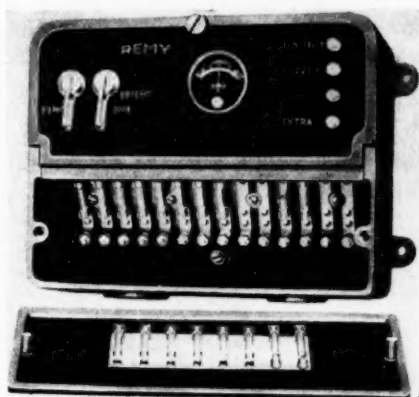
The industry is established on a foundation which cannot be shaken seriously no matter what the economic jars may be, but the force of the jars can be minimized if it proceeds cautiously for the next few months and scans the horizon carefully for signs of storms.

Electrical Equipment for Motor Buses Placed on Market

MOTOR bus development has opened up a field for electrical equipment which in the view of some engineers has not been covered with entire satisfaction by standard passenger car or truck systems. Capacity to handle a greater load and to do so with a high degree of dependability is demanded in bus service. With these things in mind the Remy Electric Co. has recently brought out special motor bus electrical equipment de-

ing on a No. 2 S. A. E. flange. There is no method of field control furnished with this generator hence a liberal sized battery must be used.

The new control box centralizes fuse panels and switches in a single unit. This unit consists of an aluminum box on the face of which are two panels. On the upper panel, which is hinged, is located the reverse current cut-outs, ammeter and all of the switches necessary for the electrical system with the exception of the starting switch. Back of the lower panel, which is held in place by two thumb nuts, is a junction and fuse block with terminal for all necessary connections. The internal wiring is complete when furnished to the manufacturer.



Remy control box with lower panel removed to show fuses and terminals

signed to serve the specific needs of bus operation and has placed a generator and a centralized control box on the market.

The generator, known as Model 971, is designed for mounting in a housing adapted to attach to S. A. E. power take-off pad on the gearset. It is of the third brush regulated type and is equipped with thermostatic control. Maximum output is 40 amp. at 1200 r.p.m. Cut-in occurs at 400 r.p.m. and 20 amp. is generated at 600 r.p.m.

The generator output is controlled as follows:

The generator field circuit is carried up to the switch panel on the dash. Here the field current passes through a resistance unit and returns to the generator through the charging circuit. This field resistance is so arranged that when the bus dome lights are turned on the resistance is automatically shunted out of the field circuit and the field strength increased with a consequent rise in the generator output.

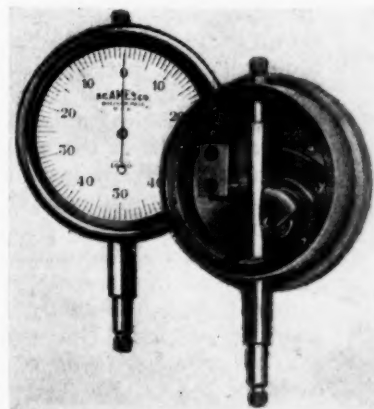
For smaller buses a generator known as Model 925-A is furnished. This generator is simply a large truck type generator of conventional design adapted for mount-

A Substantial Dial Gage

A NEW dial gage, said to possess unusual simplicity, durability, accuracy and interchangeability of parts has recently been placed on the market by B. C. Ames Co. The new gage is known as No. 55 and is said to have 16 less parts than No. 5 gage of the same make. The rack wheel and take-up wheel with spring are all on one staff so that only one bridge is required to support these parts and the center pinion. The wheel staff is said to be twice as large as that on other makes. For this and other reasons the gage can withstand considerable abuse without injury or change in accuracy.

The gages are tested and rejected in case they show an inaccuracy of more than 0.0005 in. All parts of the gage are made to jigs and are said to be absolutely interchangeable. The case is made of heavy seamless brass tubing, machined all over, and the dial is covered with a non-breakable crystal.

The design is such that the brass rack wheel and the take-up wheel contact with the center pinions but the rack wheel pushes the center pinion and the take-up wheel drags against the pinion, thus taking up all backlash in the gears.



Ames No. 55 dial gage

Poor Service Is Largely Responsible for Used Car Problem

Motor vehicles should remain longer in hands of original purchaser. Dependable repair work will reduce trading. Severe losses from depreciation cannot continue indefinitely. Selling new machines should be by-product of keeping old in good order.

By Louis Ruthenburg

Formerly General Superintendent, Dayton Engineering Laboratories Co.

IN every gathering of automobile dealers there stalks a spectre qualified by many sulphurous epithets—the Used Car Problem.

I have before me a file of newspaper advertisements which have appeared in a number of New Hampshire newspapers within the past few weeks. Their source and objective are set forth in the following paragraph lifted from one of the advertisements:

"The Automobile Dealers' Association of New Hampshire is not tied to any particular distributor or manufacturer and is endeavoring through its series of advertisements to let the owners of automobiles in New Hampshire know conditions as they appear to this Association in the hope that it may be of assistance to customers so that they may have a correct understanding of used car values and the used car problem."

This series is most significant in reflecting the desperate situation in which many dealers feel they are being placed. There is a definite attempt to convince the public with whom these dealers are in contact that the manufacturer is not assuming his share of the burden in connection with the used car problem.

It is intimated that the dealer cannot exist indefinitely between the upper and nether millstones of manufacturer and car buyer and that when he is pulverized the manufacturer will suffer.

THE eyes of the industry are focused on the used car problem. Its solution grows more vital as the replacement market broadens. Progress will be made by studying the matter in all its phases.

In this article Louis Ruthenburg attacks the problem from the service angle. In his opinion poor repair work is largely to blame for the present state of affairs in the automotive market.

Ruthenburg believes that trading can be reduced and that the stigma attached to used cars can be removed by a general improvement in service. He outlines, here, how it can be done and tells of what real service consists.

After reading the entire series of advertisements many times I come back to this statement as the most significant of many significant statements:

" * * * Who is the loser from the standpoint of economy? It would seem to be the average owner of an automobile—the man who for the sake of dependability believes it advisable to trade his car after a certain amount of use. How can the average owner overcome this handicap, avoid the excessive depreciation which the present resale value of used cars puts on his car and obtain the full value to which he is entitled? There is only one way in which this can be accomplished. The average owner can, by more careful use, by better upkeep, obtain at least 30 per cent to 50 per cent more actual use from his car than has been the rule. In other words, let him get the real life out of his car. This would mean a far less number of used cars taken in trade and would also greatly restrict the number of new cars which could be sold."

Longer Life for Cars

The sentiment expressed in the foregoing quotation seems deeply significant for several reasons. In the first place, there can be no question of acute distress among a group of merchants when they advise their prospective customers to adopt a practice which they frankly admit will reduce business volume. In the second place, they are apparently forced by this distressed condition to recognize and appreciate what must in the last analysis be an important factor in solving the used car problem—namely, that cars must remain longer in the hands of the original purchaser. Again it is interesting and significant to note that they believe that the impulse to trade results from lack of dependability of the used car.

Finally please note that while it is definitely stated that: "The average owner can by more careful, by better up-keep, obtain at least 30 per cent to 50 per cent more actual use from his car than has been the rule," there is no statement to the effect that the dealers' association is committed to a policy of more satisfactory repair work at contract prices with guaranteed performance.

Now there can be no question about the horrible depreciation of car values in service. In fact it will be readily admitted that this is, superficially, at least, the thing that creates the used car problem.

In the initial advertisement of the series under discussion this paragraph appears:

"No allowance can be greater than the actual market

value for a used car: The owner of a car one year old can figure the allowance value by deducting:

40 per cent from the present list price of his car.

A two-year car depreciates 52 per cent.

A three-year car depreciates 64 per cent.

A four-year car depreciates 69 per cent.

A five-year car depreciates 80 per cent.

"Cars over five years old depend largely on condition, but as a rule are to be consigned to the junk pile as far as resale value is concerned."

These figures are supported by schedules of depreciation according to insurance value and, in a later advertisement, by a letter from the president of the New Hampshire Fire Insurance Company.

I think there will be little disagreement with this schedule as fairly representing present average car depreciations. Isn't it a remarkable evidence of the desirability of automobiles when buyers will continue to purchase a commodity, the operation of which is represented by such a tax?

But it is a condition which cannot continue indefinitely. While the statement that the average user is the principal loser under this situation is quite accurate, *his loss is a widely distributed one*. The dealer's share in the loss is a concentrated one, and ultimately the manufacturers' loss will be a stupendous one, unless he immediately takes initiative in helping the dealer in a constructive and far-sighted way.

Use Governs Life of Car

What should be the life of a car in the hands of its initial purchaser? Isn't it entirely a measure of the care given his car? When I want to regain my perspective as to car-life possibilities I look up one of these livery drivers who operate their own cars in some of the larger cities. They usually drive large, powerful cars of ancient vintage. I pay the tax for an hour's ride. We go most anywhere, but preferably over a route that will permit me to judge the car's condition. I sit in the front seat and talk to Bill about himself and about his car. He may tell me he has driven it 150,000 miles and every mile himself.

Some of these fellows give you their mileage in much higher figures. Making all allowances for possible exaggeration and simply figuring their probable average daily mileage against the age of the car, there are a lot of them that have gone well over the hundred thousand mark and possibly a few who are pretty close to the two hundred thousand line. And for an experience with sweet running motors let me commend an occasional ride in one of these ancient chariots of the vintage of '13 or '14.

Assume that a mileage of one hundred thousand is quite attainable in the hands of a first buyer and that the average user drives ten thousand miles per year. (As a matter of fact he drives about half this distance, but we want to be conservative.) *In ten per cent of the car life its value depreciates forty per cent.*

What's wrong?

Let's examine the experience of an average user. After driving his car for eighteen months it starts pumping oil and fouling spark plugs. He takes it to the dealer and the dealer recommends the installation of a set of "No Pumpo Rings," the latest fancy ring that a glib salesman has sold him. The user asks how much the job will cost. He is told that the rings will cost him so much, but that the work will have to be done on a time basis and he can't say just what it will cost. Pressed for an estimate, he calls in his repairman and asks about how long it will take to pull down Mr. Jones' motor and fit a set of "No-Pumpo" rings. The repairman scratches his head and figures, "'Bout so many hours," and Jones is given the verdict in terms of dollars. He agrees to have the job done.

"THE manufacturer must first conceive and then successfully transmit to his dealers the conception that the retail selling of automobiles is a double barreled problem. The dealer must first of all keep cars running to the satisfaction of their users. As a by-product of this activity he will sell new cars.

"The industry as a whole—manufacturer, dealer and salesman—must obtain a fresh and radically different conception of "service" and, having seen the vision, must all cooperate actively in setting up and operating the necessary instrumentalities for making that conception a reality."

Calling for his car at the time specified by the dealer, he finds they have "had a little bad luck" and the car won't be ready until the next day. Next day he takes his car out, after paying a bill considerably above the estimate. Perhaps the oil pumping is eliminated. But about a week later he hears a "funny noise" in his motor. He asks a motor-wise friend what it is.

"Sounds like a loose 'con-rod' bearing," says his friend. He asks how that could be so when he has been careful of his oil and hasn't "stepped on her" hard for a month. His friend asks if he has had his motor torn down recently. He replies that the dealer has recently installed new rings and is told that the repairman probably failed to replace the cotters in the "con-rod" cap bolts.

From his previous experiences with the dealer the Average User is fully prepared to believe this. Next scene, Mr. Average User stages a fight with the dealer. The dealer either makes a gratis repair and figures he'll have to get either a higher commission or go out of business, or the user cusses out the dealer, decides that inasmuch as the car is losing power and his axle gears are noisy and there isn't a chance of getting a decent repair job done, he'll go out and make the best trade he can, but that under no condition will he buy another car from this particular blankety-blank Jesse James.

The details are varied, but the case is typical and it is such experiences as these which result in the impulse to trade, regardless of depreciation. And it is that impulse on the part of the Average User which throws his car on the market at a low figure. The general knowledge on the part of those who might otherwise buy used cars at good prices that used cars are not dependable and cannot be economically maintained completes the vicious used-car-price circle.

When facilities are provided in all communities for the maintenance and repair of automobiles at a cost and of a quality satisfactory to the user, the depreciation figures will be reduced in a startling degree.

Sound Approach to Problem

In the last analysis I firmly believe that this is the only fundamentally sound approach to the used car problem.

And in this matter the manufacturer must take the initiative, if his dealers are to stay in business and the manufacturer himself is to avoid the disastrous reaction of the used car problem.

Verily, we shall reap what we have sown and our chickens are coming home to roost!

Is there any sound reason for expecting the dealer, unassisted, either to obtain this vision or to organize the

forces necessary to cope with this tremendous problem? Your dealer is a salesman. He is usually neither the clear-seeing organizer of big enterprises and far-reaching policies, nor the successful operator of an efficient shop.

The manufacturer must first conceive and then successfully transmit to his dealers the conception that the retail selling of automobiles is a double barreled problem. The dealer must first of all keep cars running to the satisfaction of their users. As a by-product of this activity he will sell new cars. The retail selling problem is too generally regarded as simply one of selling as many new cars as possible with the maintenance and repair work on "old" cars dragging along, like the can on a dog's tail—an accompanying evil.

"Service" is a word which has been terribly abused and prostituted, but a better word has not appeared and in time it may be made to regain the luster of its original virtue.

I am deeply impressed with the thought that the industry as a whole—manufacturer, dealer and salesman—must first of all obtain a fresh and radically different conception of "service" and that having seen the vision, must all cooperate actively in setting up and operating the necessary instrumentalities for making that conception a reality.

We may as well start with the conception that a maintenance and repair business, properly conducted, can be made to pay a very satisfactory return on the investment, in addition to a very large return in increased good-will and consequently reduced sales resistance in the merchandizing of new cars.

Now let's try to visualize, from the viewpoint of the Average User, an ideal establishment in which there is a well-balanced conception of service and new car sales.

We shall assume that the user has talked the matter over with some of his friends and has come to the dealer with the thought of negotiating a trade. He broaches the subject to the dealer, who tells him that, while he would like to sell a new car, and will certainly make every effort to do it, if the user's decision to trade is final, he thinks that, in view of the mileage traveled by the user's present car and the minor nature of its ailments, the user ought first to consider permitting his organization to repair his old car.

Service Troubles

The user, thinking of past experiences with repair shops, demurs. Then the dealer really cuts loose and starts selling. He shows him what a new car will cost after deducting a fair allowance for the old one. He says that even a complete overhaul job on the old car will cost less than half as much and that the old car, overhauled, will be just as serviceable in every respect as a new one. He proposes that if the user will allow him half a day for inspection he will submit a contract setting forth in detail the nature of all work he proposes doing, with definite prices for that work. He shows him the form of contract which warrants repair work to the extent of gratis reoperation.

Then he asks the user to walk through his repair shop with him. He shows him a clean, orderly shop. In one part of the shop incoming and outgoing work is being inspected. In another place units are being disassembled and cleaned. On well lighted racks and benches the actual work of assembling and adjusting is being done. A small, but clean and effective-looking group of machine tools occupies another section of the shop. Repair parts are carried in well arranged stock racks behind a neat wire-screen partition. Every man in the place seems to know his job and is working diligently. The men at the benches and machine tools are obviously mechanics who know their business.

The user is sold to the extent of leaving his car for inspection. The next day he signs the repair contract, after going over it carefully with the dealer, who explains it in detail. His car is delivered on the day originally promised. He finds the work satisfactory and figures that the dealer has saved him quite a considerable sum of money. Under these conditions is it surprising that he becomes a first-rate booster for that dealer and sends his friends around to do business? Is it astonishing that he looks forward to eventually buying a new car from that same dealer?

Organization of Dealer's Business

Now suppose we find out from the dealer how he organized his business. He tells you that until 1923 he had the same troubles that a lot of dealers were having, but that about that time the manufacturer whose cars he was selling took hold of things and began to help him with his problems. The dealers in his section were first called into a meeting with the district sales manager, the general sales manager and the president. The new policies were outlined to them and they were told that they would have real help from the factory in making them effective. They were told that it was a fifty-fifty proposition.

He goes on to say that some of the dealers were pretty skeptical, while others figure that as long as the "old man" was behind the deal, something would happen. Things did happen. The district sales manager brought to this dealer's establishment a chap who had been a superintendent at the factory and they all sat down and figured a new layout for the repair shop and listed some new equipment. The dealer's old foreman didn't like the layout and said that "it couldn't be done" and a wire was sent to the factory to send on a new foreman. It seems that the factory had established a school for training repair shop foremen and the new man was a product of the school.

The next day the old foreman felt pretty sick and he was easily persuaded to go to the factory to spend a month in the foremen's school. The foreman from the factory worked with him for a while after he returned and was then assigned to another job. A month in the factory school made a new man of the old foreman and he requisitioned a couple of good mechanics from the factory. Since that time the shop has been improving constantly. The men make good wages and like to work under the dealer's present shop conditions.

The dealer explains further how the major jobs of repair work were standardized as to price and wage payments, the wage payment being a sort of premium or piece work job as far as the men in the shop were concerned. Naturally, this required a lot of work in making up job instruction sheets and in making time studies of the work. All of this was done in the factory. But it paid well because it took all the guesswork out of figuring the cost of jobs and, with the right kind of inspection, a fair profit and a satisfied customer was assured.

Along with this work the factory developed special repair racks, fixtures and tools which cut down the time for given repairs very considerably.

It seems that the district sales manager had a number of assistants working with him at this time. They had a considerable amount of training at the home office and spent their time among the dealers, demonstrating methods of handling customers so as to increase their good-will by giving them real service.

The dealer admits that he was a little afraid of all this "interference" with his business just at first, but the factory men kept selling him on the fact that he could make a better return on his investment by following the new policies and before long he could see that they were right, by the results in his own business.

Remy Starter with Right Angle Drive Used on Copper Cooled Chevrolet

New type of gearing has teeth on face of flywheel instead of on rim, yet sides of teeth are not convergent as in bevel gearing. Spur starter pinion slides on splined shaft and is engaged by starter pedal acting through a helical spring.

AMONG the interesting features of the copper cooled Chevrolet chassis which could not be covered in detail in our original description of this car is the vertically mounted Remy starting motor and what is to the automotive industry the new form of right angle gearing which transmits the drive from the starter pinion to the flywheel. The pinion is splined to the armature shaft of the starting motor and is arranged to slide on the shaft when the starter is engaged. This spur pinion has ten straight teeth of the regular involute form, the ends of the teeth being chamfered as in the case of other gearing which is meshed by clashing or movement parallel to the bearing face of the teeth.

The teeth on the flywheel are cut on the face rather than on the periphery, as will be seen by accompanying cuts. The ends of the teeth are contained in a plane at right angles to the axis of the flywheel and the bearing faces of the teeth are not convergent as in the case of bevel gearing. These teeth are of involute form and are cut with a spur gear cutter of the same size as the pinion. Contact between the pinion and gear teeth is a line and not a point, as some have conjectured. There are 108 teeth on the flywheel. They are 8-10 pitch and have a 20 deg. pressure angle. The teeth are generated on a standard shaper modified in design for this class of work, made by the Fellows Gear Shaper Co., which concern was responsible for developing this type of gear.

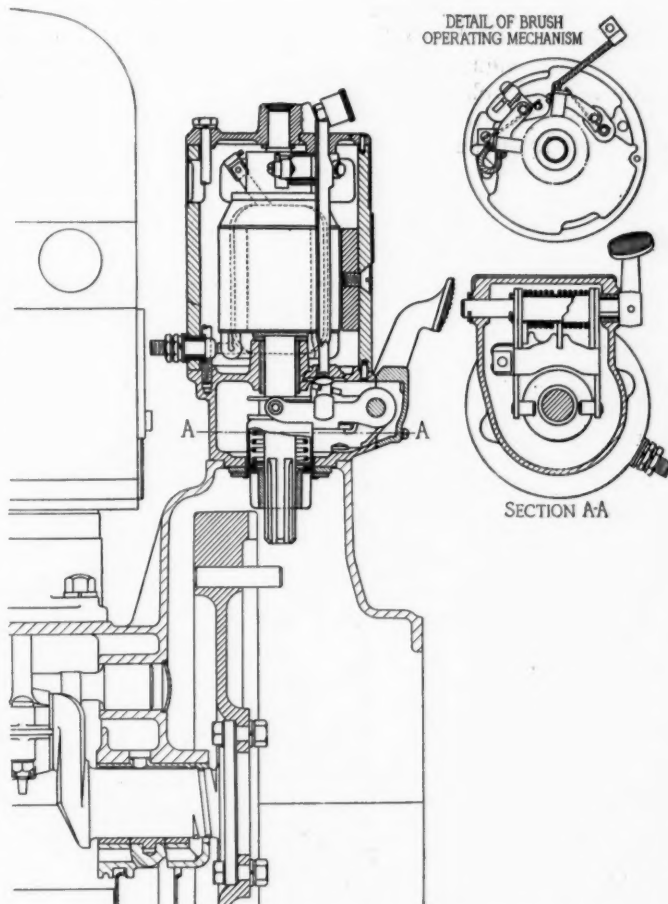
The general appearance of the teeth on the flywheel has been described by saying that they are, in effect, bevel teeth placed on a plane rather than on a conical surface. The gear can be figuratively considered as a rack bent round into circular form, after which the

teeth are cut away in such manner as to avoid interference. While the bearing portion of the tooth surface has a true involute form it is convex over a part of its length, like the tooth of a spur gear, and concave over the remaining portion, like the tooth of an internal gear.

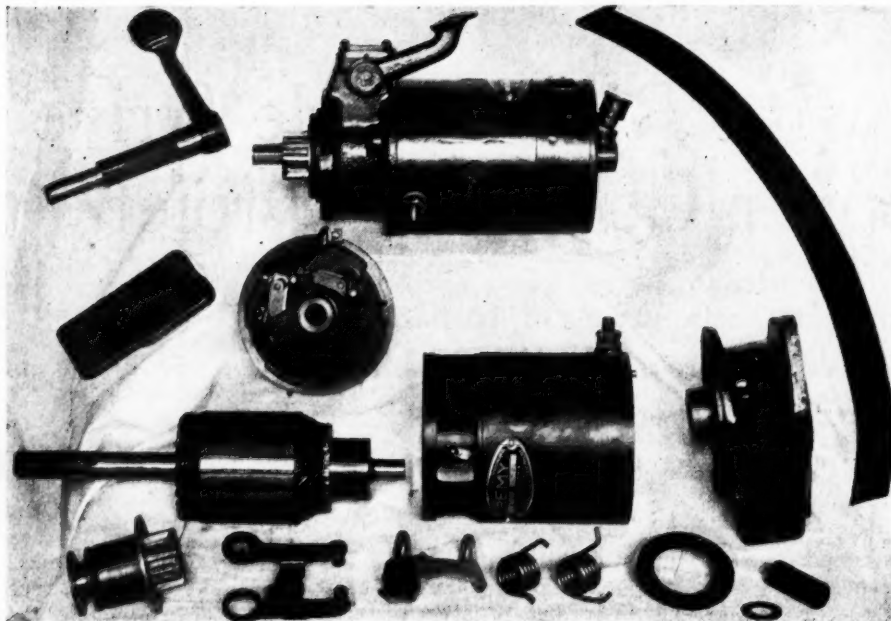
Engineers of the Fellows company regard this type of gear as being eminently satisfactory even for continuous service, so that it may well find other automotive applications. In fact some further applications of the gear in a somewhat different form are now in process of development.

A straight mechanical engagement of the starting motor pinion is effected by simple pedal pressure. The starter pedal thrust is transmitted to the sliding starter pinion by a fork and collar through a coil spring interposed between the pinion and the collar. The pinion travels on the six-splined end of the starting motor shaft. The fork which operates the collar also carries a cam bar actuating a roller follower on the brush lifter. The cam bar is so formed as to cause brush contact when the collar has moved three-quarters of its total travel. The starting motor rotates at full torque the instant brush contact is made.

As the starting pedal is depressed, two conditions can prevail: (1) The pinion may be pushed directly into mesh with the flywheel gear, or, (2) the pinion and gear may be so aligned that the teeth of the pinion butt against those of the flywheel gear, preventing engagement. In the first case, as soon as the pedal has carried the collar three-quarters of its total travel, the brush contact is made and the motor starts, under full torque, to rotate the engine. In the second case, that is



Vertical sectional view of Remy starting motor, on flywheel housing of Chevrolet copper-cooled car. The end of the splined shaft along which the pinion slides can be seen opposite the face of the flywheel at the top



Complete Remy starting motor and its component parts

when the teeth butt and engagement is not directly possible, the continued movement of the pedal compresses the 15 to 17 lb. coil spring interposed between the collar and the pinion, until the collar has moved three-quarters of its travel. At this point brush contact is made and the motor starts to rotate under full torque. As soon as the pinion has moved 1/16 in. it is snapped into engagement by the compressed interposed coil spring. The pinion teeth are so chamfered that 1/16 in. is the greatest distance the pinion can travel before it will spring into engagement.

A strong coil spring, acting between pedal yoke and the starting motor housing, returns the pedal to normal position and disengages the starting pinion when the driver's foot is lifted from the pedal. Tests on this installation have been made up to 1000 engine r.p.m. before disengagement. This corresponds to 10,800 r.p.m. of the starting

motor and while this is severe service and not likely to be met in practice, no noticeable damage was done the motor. The material in the pinion is untreated S.A.E. 1045 steel, much softer than the cast iron flywheel which is held to scleroscope reading .30 to .50, so that wear will be taken by the pinion rather than the flywheel gear.

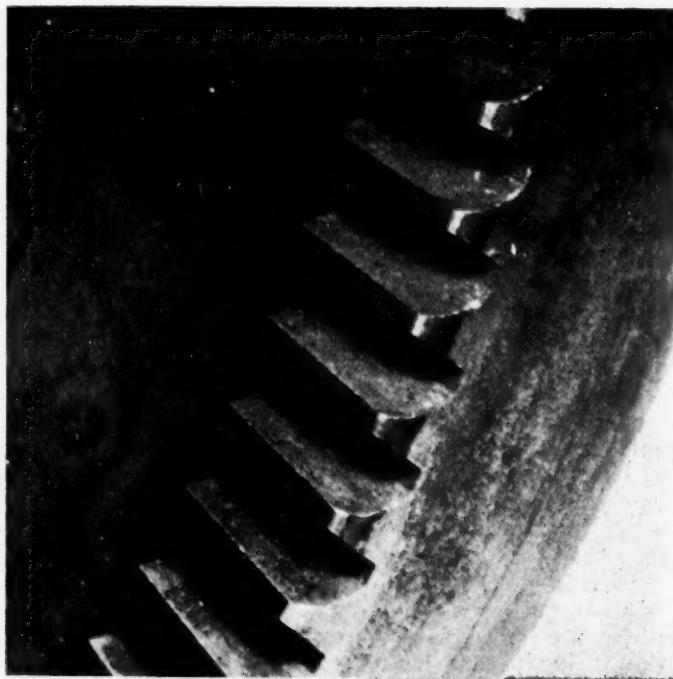
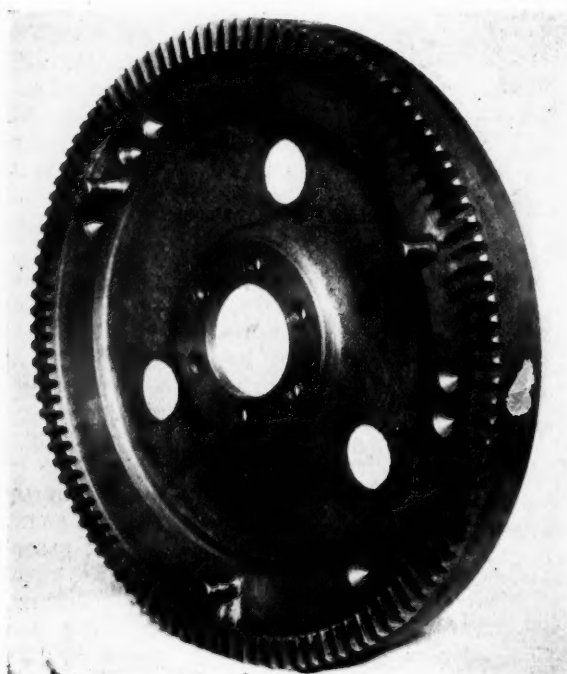
The detail of the brush lifter does not differ much from the standard Remy type. The cam bar normally holds the brush out of contact with the commutator. As the pedal is depressed, the cam bar is pulled along until the fork has moved the collar three-quarters its total travel, when the contour of the cam bar brings the brush into contact. With the exception of the roller follower on the brush holder, the cam bar and the pedal linkage the starting motor is the standard 12-lb. Remy motor. Its electrical characteristics have been in no way altered.

The motor shaft is carried on the General Motors grapho-bronze bearings, which have certain self-lubricating qualities. The upper bearing is, however, provided with a grease cup.

To prevent spinning of the motor shaft after disengagement there is a brake consisting of a flange piece on the cup containing the interposed spring, which comes into contact with a leather washer on the face of the motor housing when the pinion returns to normal position.

A COMPILATION of mechanical engineering detail tables has been made by John P. Ross, an Englishman. This work is intended for the use of designers, draughtsmen and works managers to facilitate ascertaining the proportions of a number of machine details, information which hitherto has appeared in scattered form.

"Mechanical Engineering Detail Tables" is published by Isaac Pitman & Sons, New York.



Flywheel showing detail of teeth. These resemble in some respects teeth on a bevel gear but are on a flat rather than a conical surface

Tillotson Producing Fixed Venturi Carbureter Without Air Valves

Latest instrument has two nozzles one of which functions only during idling and low speed operation. Well of fuel assists rapid acceleration. Float valve made of Monel metal.

DURING recent years there has been a marked tendency toward the use of carbureters which have no moving parts in the nature of air or fuel valves and which are made as simple as possible in order to avoid such troubles as often occur when an instrument involving movable parts which can be easily put out of adjustment is employed.

The Tillotson Mfg. Co. is now producing a carbureter in which the only parts which move in the normal functioning of the instrument are the parts of the float mechanism, the throttle and the choke butterfly valves. This instrument is of the fixed venturi type without air valves and is made in top outlet and side outlet types, the former of which will be described, since both operate on the same general principle.

As will be seen from the accompanying sectional view, the carbureter is fitted with two nozzles or jets, the main jet being placed centrally in the venturi tube and the secondary or idling jet at one side with its discharge opening adjacent to the edge of the throttle when the latter is in the closed position. The secondary jet is intended to handle engine operation under idling or extremely low road speed conditions, while the main jet is effective at all higher speeds.

The main nozzle marked M in the cut is so arranged as to feed a mixture of air and fuel into the venturi tube and the vertical type is set at an angle in order to secure smooth delivery of fuel into the air stream and to offer minimum resistance to flow, through the venturi. The main nozzle is restricted at the bottom where a submerged orifice is provided. The space around the nozzle, together with the middle cross channel and part of the channel surrounding the secondary nozzle termed the by-pass tube, act as a well from which fuel can be drawn quickly during periods of acceleration.

This well is filled through holes in the nozzle, opposite the cross channel. The upper holes in the nozzle permit air to be drawn through the upper cross channel and the upper part of the channel surrounding the secondary nozzle. The air which enters these channels is drawn through the hole A, which is open to atmosphere.

This air passing through the main nozzle tends to atomize the fuel before it leaves the nozzle. After the accelerating well is emptied of fuel air is drawn through the lower cross channel and the lower holes in the main nozzle.

The main control on the fuel supply is the orifice R, the size of which can be varied by the adjustable needle valve N. The by-pass units consist of a threaded plug into which the tube B is pressed. This tube is restricted at the top to limit the flow of fuel. The tube conveys the

fuel to mixing chamber C, where the fuel is mixed with air which enters the chamber via the opening around the adjustable needle on the end of the knurled screw K. The mixture thus formed enters the carbureter through the small hole and slot at the edge of the throttle valve. The last mentioned hole is so placed as to be half covered by the lower edge of the butterfly when the latter is closed tight. As the throttle is opened more of the hole is exposed to the suction above the throttle and therefore more mixture will flow through the by-pass.

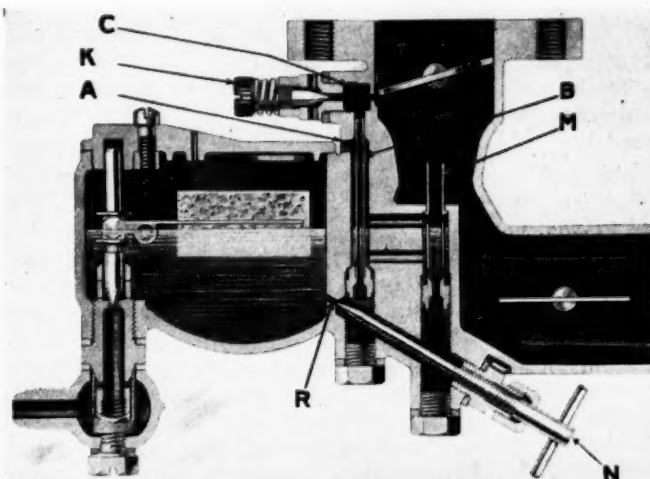
The hole in the side of the by-pass tube assembly near

the angle shoulder breaks the suction and prevents the by-pass from supplying fuel at medium high speeds. By taking the fuel which enters the by-pass tube from the same channel as that supplying the main nozzle, the by-pass ceases to supply fuel after the main nozzle starts to draw strongly.

It will be noted that the throttle is set at about 15 deg. to the horizontal in the closed position so that it travels only 75 deg. from closed to wide open position. The throttle stem is provided with a stop screw which can be adjusted to control the minimum idling position.

A cork float of more or less conventional type is provided. It is fitted with two rounded fingers forming a yoke, which bears upon the collars of the inlet valve spool. The fuel inlet valve is made of Monel metal and is guided top and bottom to insure perfect seating. The float bowl is integral with the body casting as is also the air horn and venturi, thus limiting the total number of parts. The venturi is machined to maintain uniformity in size.

A fuel strainer and a butterfly choke are furnished.



Model M Tillotson fixed Venturi carbureter without air valves

Just Among Ourselves

Higher Prices Discussed

TALK is heard in many quarters of probable increases in the prices of motor vehicles. There are those who contend such a move would stimulate sales. Their theory seems to be that the public would go out and grab automobiles before they went any higher. Sales don't need stimulation but price advances probably will be inevitable if the industry continues to cooperate in raising the cost of materials.

Parts Makers Optimistic

MOST of the leading parts manufacturers seem to feel that the volume of business in 1923 will greatly exceed that of 1922. Most of them have heavy commitments covering the first half year, but there is a feeling that vehicle makers are buying for future needs in expectation of higher prices. While no orders have been placed for deliveries later than July 1, many of the parts men are convinced that any slump after that date will be purely seasonal in its nature and that the second half will be almost as good as the first.

Service for 7c. a Day

SEVERAL of the larger Overland dealers have adopted a flat rate service plan on a yearly basis. That is, they give purchasers a certificate guaranteeing one year's complete service, labor and parts included, at the rate of 10 cents a day. Now one of the largest Ford dealers in Greater New York has adapted the plan and makes the same offer for seven cents a day, or \$25 a year. This is pretty substantial evidence not only that these dealers have confidence in the products they sell

but that they have a full realization of the importance of service to their customers. It also will have a tendency to keep in their hands work which will return a substantial profit if it is properly handled.

General Motors Prospering

THERE is substantial reason to believe that the forthcoming annual report of General Motors Corp. will show net profits approximating \$50,000,000, which will be highly gratifying. Executives of the company believe that unless there is an unexpectedly severe business slump some time this year, 1923 profits are quite likely to double those of last year.

Selling Fleets of Motor Cars

WHEN fleets of motor vehicles are mentioned we have been accustomed to think of trucks but a great many big companies now are operating fleets of passenger cars for their salesmen and other employees. These companies are known as national buyers and they usually supply their men with identical models. That this business has reached substantial proportions is evidenced by the fact that we have heard of at least two companies which are offering special discounts of from 10 per cent to 15 per cent to purchasers of fleets of six or more. One of the companies also offers a discount of 20 per cent on replacement parts, no matter where they are purchased.

Bragging About Dealers

MOTOR vehicle manufacturers never have been noted for the conservatism of their expression in comments on the volume of business they are doing. Some of them, in times

past, have been accused of more or less exaggeration in telling of their production. Fashions change, however, and the most blatant exaggeration now is in reference to the number of dealers on their lists. For example, one company producing a specialized unit car, claims to have 1500 dealers and another in the same class declares it has 1100 dealers. Production of each company in the last quarter of 1922 was approximately 1000. A good many dealers had no visible means of support, therefore, unless they had an income from some other source. The facts are, however, that the first company actually has about 300 dealers and the second about 400.

Durant Output Leaping

IT is rather difficult to think of an enterprise so new as one of the big producers of the industry, but Durant output is increasing with amazing rapidity. The February total showed a gain of 30 per cent over January and unless his calculations fail March will show an equal gain over February. The January total for all his lines was 10,893 while in February, a short month, it was 13,905. The Star total last month was 10,794 and output of this line at the Elizabeth plant is just getting under way. Shipments of Durant fours and sixes last month aggregated 2989. Locomobile is going stronger than it has in years and the light Mason truck is off to a good start.

Novel Merchandising Plan

ONE of the most interesting experiments ever attempted in the retail sale of automobiles is the plan put into effect by the R. & V. Motor Co. which has, in effect, abandoned its own dealer organization except for

More or Less Pertinent Comment on Topics of Current Interest to Men in the Industry

branch houses in Baltimore, Boston, Chicago, Cincinnati, Cleveland, Kansas City, New York and New Haven. It will depend for distribution upon dealers in non-competitive lines who will be given discounts on a sliding scale on all sales they make, depending upon the effort they expend. The company believes that dealers in lower priced lines, in small towns especially, can find prospects who will buy Knights even without carrying demonstrators, if they will agree to give service. Engine repairs will be guaranteed by the company. Assistance also will be given by means of a national advertising campaign.

The industry will watch the experiment closely and if it succeeds it may lead to radical changes in merchandising methods.

Battling Used Car Evil

THE Automobile Merchants Association of New York, which is composed of distributors and dealers, finally has decided that cooperative action is possible in dealing with the used car problem. The special committee appointed to consider the subject has recommended adoption of a plan substantially the same as that followed by the Boston Used Car Statistical Bureau. Briefly, this involves an agreement by each subscribing member to supply the association with the prices received for all used cars sold in the last six months, by months, and to continue to supply this information semi-monthly. From this information a loose leaf booklet will be compiled showing the prices actually paid by the public for different models and makes of cars. This is designed to be a guide for future trades because it will show the market values of used cars.

Studying Highway Transport

THE study of transportation which is to be undertaken under the direction of the Chamber of Commerce of the United States for the avowed purpose of bringing about a greater degree of cooperative effort, will include "proper coordination of motor transport and use of highways" as one of its major considerations. Phases which it now is proposed to include in this survey include: scope of competitive motor transport under present railway schedules and under revised schedules, when worked out; pick-up and delivery and short haul motor service as part of railway transport or as separate service or coordinated with rail transport; motor transport in railway terminal service with possible economies; necessary regulation, having in mind preservation of flexibility of competition and freedom of action in motor routes; proper protection of freight and passengers against damage and proper taxation and licensing.

Car Makers Criticised

IN the preparation of its report the committee made several pertinent statements which should be of interest to manufacturers. One is that "our used car troubles have been augmented by the insidious practices of factories in making special trading allowances. This policy is being brought out into the limelight daily and not only is it destroying confidence on the part of the purchasing public but it also is reducing materially the re-sale value of cars." Another statement is that "the public have played us one against the other and by virtue of suspicion and lack of confidence in one another we have believed the

public with their various quotations on used car allowances." Another confession is that "we do not intelligently read our balance sheets and we fail to see the red figures in their entirety" so that "a clear vision of the used car losses" is not possible.

Do Motor Cars Last Longer?

IS the useful life of an automobile increasing?

Leonard Ayres, economist of the Cleveland Trust Co., has decided that it is. His deduction probably is correct but the car has a much more hectic career than of yore. It's a good deal like the country school teacher in the old days who "boarded around." The teacher had to have a strong constitution and the same is true of the car of today. It learns to know a lot of masters on the way to the junk pile, for apparently nobody wants to keep it more than a year or so. Time was when real affection was lavished on the automobile but now it's considered chiefly as a means of transportation.

Few Inexperienced Drivers

AYRES believes the life of the average car has been lengthened from about six seasons to at least seven. We don't like the word "seasons" in relation to a motor vehicle, however, for it is rapidly becoming a year 'round utility. The three main reasons for the increased longevity, he believes, are better cars, better roads and better drivers. He infers that drivers are more skillful because until recently from a quarter to a third of the drivers always were inexperienced motorists driving their first cars while now only about 10 per cent of them are new each year and the remainder are experienced operators.

J. D.

New Constant Potential Generator Furnishes Ignition Current

Machine with inherent regulation holds terminal voltage within permissible limits for lighting purposes for a speed range of 3:1. Regulation by double magnetic fields working in opposition.

By W. P. Loudon

Engineer, Automotive Department, Westinghouse Elec. & Mfg. Co.

FROM time to time the desire has been expressed for a small lighting generator to operate in connection with automotive engines under conditions where it is not desirable to use a battery. This service will be met mainly on tractors, heavy trucks and engines of the governed type for constant duty at intermittent periods. The problem is made complicated by the fact that, while the maximum speed of the engine is, of course, limited, there are cases where it will be operated at speeds less than the governor control point, at which times the generator must still deliver its rated output.

In the tractor field it has been found desirable and is often regular practice on larger farms—to operate the tractor at night either for field work or as a power drive which, of course, is impossible without proper lights. On account of this necessity a simple and reliable type of constant potential system would appear to be the logical solution. If the generator is able to fulfill these needs without complications or delicate accessories, it will be more able to withstand the requirements demanded in tractor service.

A similar field will be found for this system on large capacity trucks, used for long distance hauls between widespread points. On many such trucks electrical starting means have not been provided and as it is often necessary to drive at night over unlighted highways, they are equipped with the old fashioned acetylene lamps, with their ineffectual light, attendant danger and inconveniences.

Many forms of constant potential systems have been devised and used for various purposes besides automotive ignition and lighting, to which latter type this article

mainly refers. They may be listed in the following order:

- a. Constant Speed Class
 1. Power house dynamos with Tirrel regulator.
 2. Cumulative compound wound dynamo.
- b. Variable Speed Class
 1. Dynamos regulated by separate exciters.
 2. Dynamos regulated by armature reaction. (Rosenberg).
 3. Shunt dynamos with vibrating type regulators.
 4. Dynamos having inherent regulation.

The variable speed dynamos used for battery charging have been omitted from the above tabulation, since if the battery be removed, the source of regulation is destroyed.

The variable speed generator having means for inherent regulation is unquestionably the most desirable of all of the constant potential systems, since it is automatic in its regulation without the complication of external means. It is, however, due to certain magnetic laws, necessary to limit the use of this generator to governed engines, where the speed range between idling and governed point is not over 3:1.

Inherent voltage regulation generators have been accepted as defining that type of machine which will, by means of its own peculiar combinations of windings and mechanical features, deliver a substantially constant voltage at the terminals at variable speeds and loads without external regulating devices or relative movements of any of its component parts, with the exception of the rotation of the armature in the fields about its own axis.

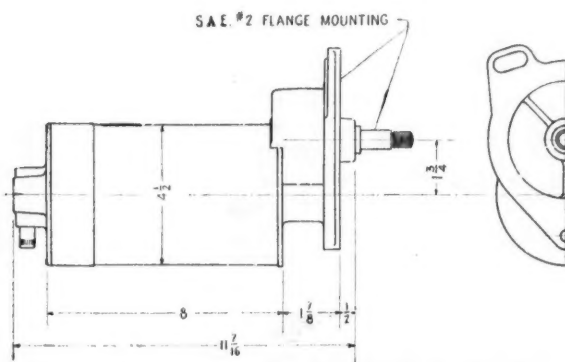


Fig. 1—Outline drawing of generator with No. 2 standard flange mounting

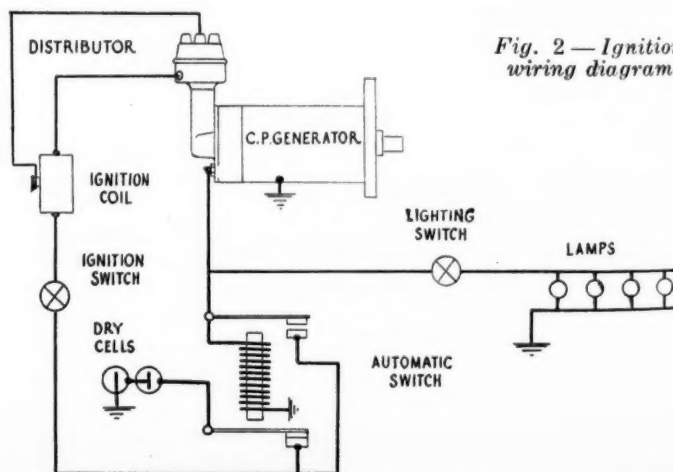


Fig. 2—Ignition wiring diagram

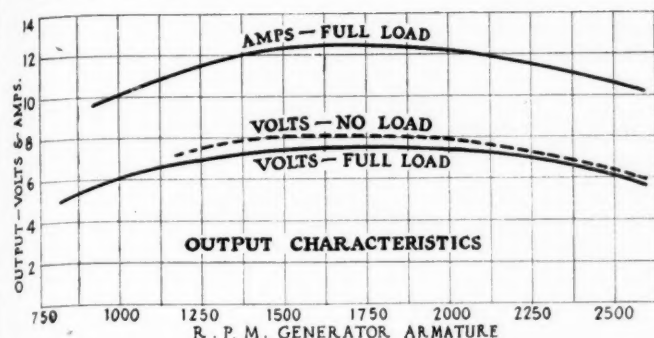


Fig. 3—Generator output characteristics

Fig. 1 shows the approximate size of a constant potential dynamo capable of delivering an output of 80 watts at speeds of the drive shaft between 400 and 1200 r.p.m., which represent the range from the idling to the governed speeds of the usual heavy duty engine. The weight is approximately 28 lbs. with gearing which is a trifle more than one-half of the weight of a storage battery.

It is not only able to supply ample output for lighting, but in addition, in combination with several dry cells for starting, will furnish the ignition current as well.

The ignition starting feature mentioned above presents no more complication than does the impulse coupling. It consists simply of a single throw "on and off" switch and a relay whose purpose is to automatically throw the ignition load onto the generator when the speed of the latter is sufficient to carry it and to also reconnect the dry cells into the circuit should the generator speed fall below this point.

While the inherently regulated type of generator possesses all of the desirable characteristics for properly charging a battery and under these conditions the speed range can be materially increased, the extra weight and cost involved would scarcely be justified in view of the successful operation of other types of dynamos for this service. However, due to the absence of moving parts for regulation, it is reliable and the danger of failure or trouble is no greater than with the types of machine in use today as standard equipment.

Although, as we have already seen, there is an actual field of service open for the constant potential generator, there are nevertheless certain requirements which it must fulfill before it can obtain consideration for this work. It must first of all be comparable to the present types of automobile generators in size and weight and also in cost. The efficiency and heating for a given output should lie inside of practical limits. The maximum voltage variations between its operating speed range must be confined within such values that the lamps will neither burn out nor their life be shortened. Finally its speed range must at

least be such that proper voltage for lighting can be obtained not only at the governed or maximum speed but at the minimum or idling speed as well. Figure 4 illustrates the relative size of a third brush generator and a constant potential generator designed for the same output at the same speeds, the third brush generator being represented by the shaded portion.

The following table will serve to make the comparison more clear.

	3rd Brush Type	C. P. Type
Average voltage	7	7
Maximum output (Watts) ..	80	80
Minimum speed r.p.m.....	1000-1200	1000
Speed range	Indefinite	3-1 Max.
Efficiency (min. speed)....	45%	35-40%
Ult. temp. rise (frame)....	70°	70°
Weight gen. only	20 lb.	25 lb.
Weight incl. battery.....	65-70 lb.	...
Cost gen. only—ratio.....	1	1 1/3
Cost incl. battery	2	...

The voltage and output characteristics of the constant potential generator both for full load and no load output are clearly shown in Figure 3, the abscissas representing the actual speed of rotation of the armature which would be the same whether the machine were equipped with a gearset or not.

Problem of Design

The design of a generator of type described in this article presents a problem somewhat different from that encountered in the ordinary type. We have not one, but substantially three machines to consider, each with its own individual characteristics, which must be combined into one compact unit and which must be so correlated as to give the desired output performance.

The generator consists of two distinct armature cores, mounted on the same shaft and having a single continuous winding and a single commutator. The frame carries two sets of poles in sectional alignment with the armature cores. Their diametrical arcs are of different lengths, however, leaving a portion of the armature which for the instant is spanned by only one of the poles. Three brushes bear on the commutator, two being the usual load brushes, the remaining or third brush being located under the tip of the short pole.

Regulation is secured by utilizing the differential action of magnetic fluxes. The main poles are saturated and carry the flux required to generate the main voltage. Since the poles are saturated the voltage in the portion of the armature conductors under their influence will increase directly with the speed.

The regulating poles are unsaturated and carry flux opposite in direction to the main flux and which therefore causes a voltage to be generated in the portions of the

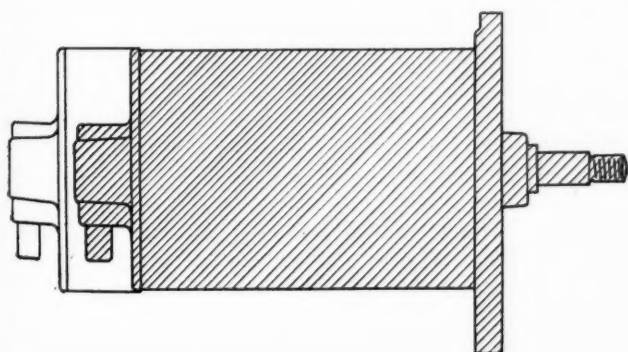


Fig. 4—Comparison of sizes of third brush and constant potential types of generator

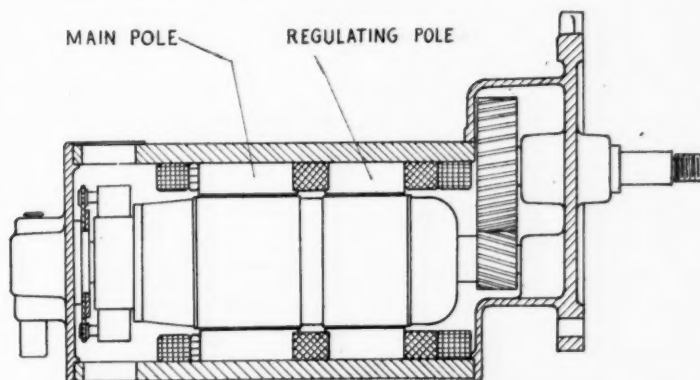


Fig. 5—Sectional view of constant potential generator

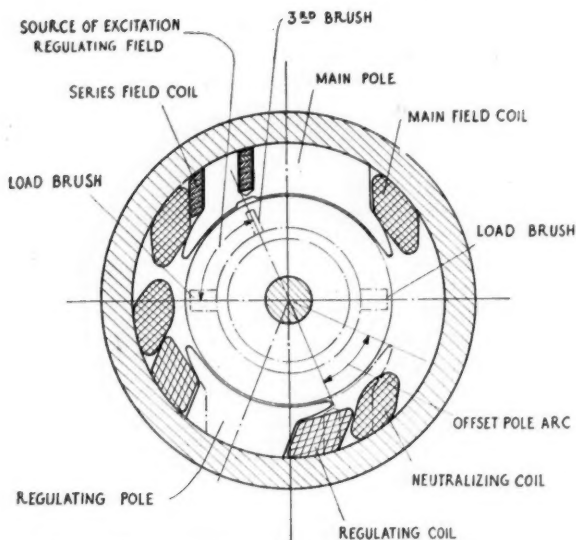


Fig. 6—Cross section of generator showing main and regulating poles

armature conductors under their influence opposite to the main voltage. As the regulating poles are unsaturated, the "bucking" voltage increases as the square of the speed. It is, therefore, possible to so choose voltages whose difference at a minimum speed will be equal to the difference of the voltages obtained at a speed of twice the minimum. Thus it will be seen that for a limited speed range a constant output potential will be obtained. Owing to certain magnetic laws, the voltage will rise slightly at the speed point midway between the minimum and maximum. If we permit this rise to increase appreciably, we find that the speed limits of the machine can also be increased, and in this respect advantage is taken of the fact that 6-volt lamps can be used on circuits of 8 volts pressure, to increase the range to 3:1. The curve Fig. 3, shows this clearly.

At the governed and idling speeds, which are the points where the engine mainly operates, the line voltage is correct, i.e., 6 volts, and the higher voltage is reached only during the transient speeds where the engine seldom runs continuously. It should here be noted, however, that this maximum voltage is not at all infrequent in battery

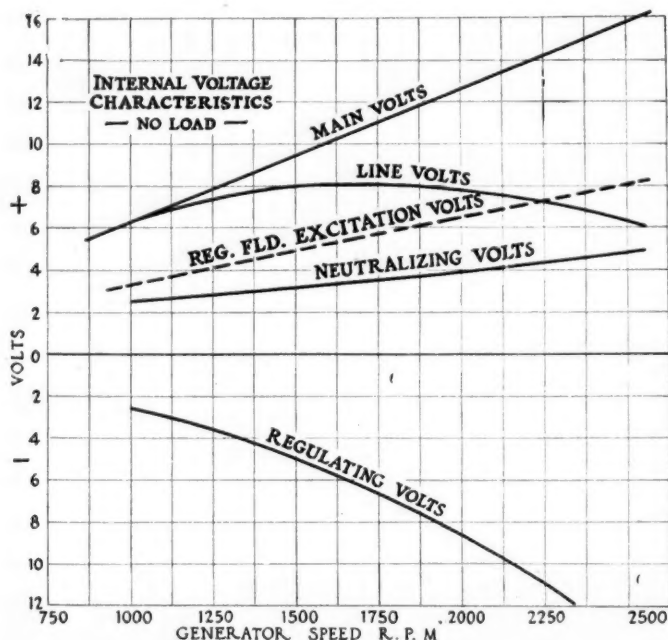


Fig. 7—No load internal voltage characteristics

systems, where the battery when nearly charged reaches a potential of about $8\frac{1}{4}$ volts.

The main field shunt windings are connected directly across the load brushes, i.e., constant potential, so that their excitation remains practically constant after the minimum speed is reached and the losses are therefore constant. It is possible to connect this field in this manner since the main pole spans the normal arc of the armature and there are no conductors influenced by opposing fluxes which are not also governed by the main flux, the latter always predominating.

As stated above, in the case of the regulating pole, in order to obtain a voltage which increases as the square of the speed, it is necessary to use an unsaturated pole, in which the flux will increase or decrease directly as the excitation varies. Therefore, it is necessary to have a source of potential present in the machine which will at all times vary in proportion to the speed of the armature and which will not be affected by the other voltages present. For this reason the regulating pole arc is made shorter than that of the main pole, leaving a section of the armature in which the conductors are influenced only by the main or saturated flux. The voltage generated in these conductors satisfies

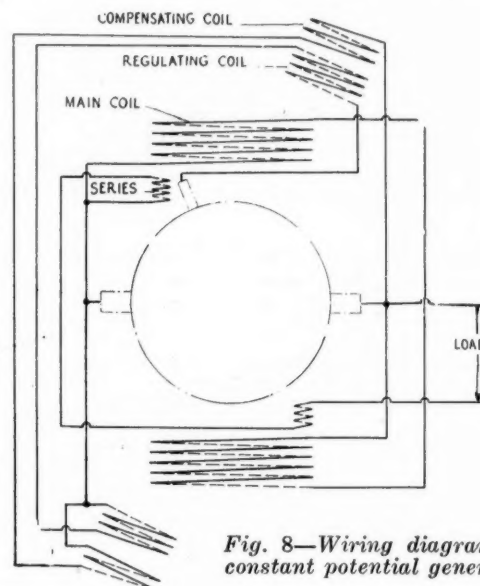


Fig. 8—Wiring diagram of constant potential generator

these requirements and the excitation for the regulating field is obtained from this source by means of the "third" brush. In similar machines previously proposed, the rising potential was secured by means of an additional exciter, which constituted an extra element and the generator was therefore complicated and costly, and not inherent in its regulation characteristics. The value of this voltage at various speeds will be apparent from Fig. 7.

In the foregoing it has been assumed that for a given speed it is necessary to generate a main voltage in excess of the line voltage, and from it to subtract the regulating voltage. If now, we add a third winding, equal and opposite in value to the regulating winding at the minimum speed, so that its net effect is zero, we need then only to generate the desired line voltage in the main windings. This obviously permits a smaller size of machine for a given output. This winding, which we shall call the "neutralizing winding" is also connected across the constant potential circuit, so that at the maximum speed the increased excitation of the regulating field will permit the latter to become effective. The result is shown in Fig. 7.

It so happens that in a generator of the size suitable for automotive use, the proportions of the main shunt coil and the neutralizing coil are such that they may be combined

reaches
directly
so that
after the
therefore
is man-
e arma-
pposing
flux, the
pole, in
square of
pole, in
the ex-
source
l times
l which
or this
an that
which
curated
atisfies

into a single winding, thereby eliminating two sets of field conductors which would otherwise be placed between the poles. (Fig. 9.)

Up to this point the procedure has been based on operation of the machine at "no load." If, however, load currents are drawn from the armature, new complications are introduced which have a material effect on the design. These load currents passing through the armature conductors, set up a magnetic flux of their own, known as armature reaction, the direction of which is at right angles to the main fluxes. The effect and relation of these reaction fluxes on both the main and regulating fields is shown in Fig. 10.

In the case of the main poles, the direction is such that it opposes the flux used to generate the exciting voltage for the regulating poles. Thus the effect of these poles would be materially decreased under load. This would be advantageous in compensating for armature voltage drop caused by the resistance of the armature windings and the brushes. However, the reaction flux bears such a relation to the regulating poles, that it also decreases their effect directly. The combination of the decrease in excitation, coupled with the direct magnetizing effect, would be too great, as it would nullify the effectiveness of these poles.

It has been found that the direct demagnetizing effect of the armature reaction on the regulating poles is suffi-

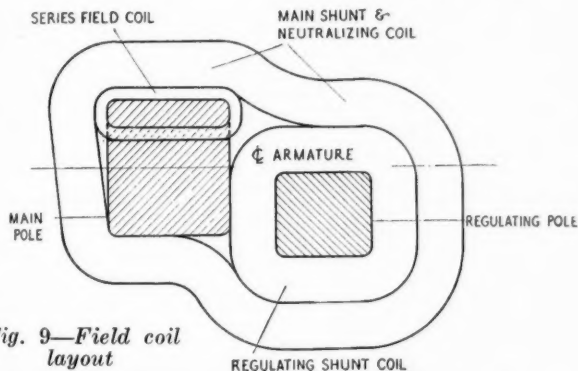


Fig. 9—Field coil layout

cient to compensate for the armature voltage drop and that the effect on the main pole must be eliminated so that the excitation of the regulating windings remains constant regardless of load conditions. To this end, a series compensating winding is added to that section of the main pole governing the regulation shunt excitation voltage. The value of this series coil is such that it just cancels the value of the armature reaction under the main poles at any load. The complete wiring diagram is shown in Fig. 9.

To properly visualize the resultant values of the different fluxes which are present during the operation of the machine, recourse is made to what is commonly known as field forms (Fig. 11). The areas of these curves represent the value of the total flux and may also, when proper constants are used, show the density of the flux in the various points of the air gap. For instance, the upper form is the flux in the main or saturated poles, the slight dip being the loss of flux due to the greater reluctance of the air gap caused by the depression made in the pole face just over the third brush for commutating purposes. It is the same value for both no load and full load, since the series compensating windings cancel the effect of any armature reaction fluxes under these poles.

The lower forms show the fluxes generated by the regulating winding, with the effect of the neutralizing windings taken into account. From this the increase in flux due to the increase in excitation can be clearly seen. The no load fluxes are uniform and symmetrical. When load currents are present in the armature, however, the fluxes are increased on one side of the center line and decreased

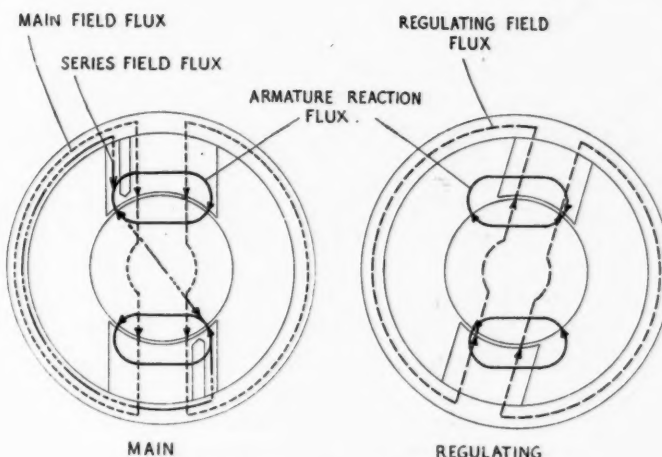


Fig. 10—Full load flux diagram

on the other. Why this is so can be seen from the directions of these fluxes as shown in Fig. 10. On account of magnetic saturation, the increase will not be as great as the decrease, consequently the area of the resultant flux is less than that of the original no load flux. By means of these diagrams, the calculations for a machine can be verified, so that the finished product can be depended upon to follow the calculated outputs very closely.

The two-pole design has been used as an illustration throughout this article as it presents less complication in the diagrams and sections. However, there is no fundamental reason for limiting the design to this number of poles and they may be increased with equally good results. Nor is it necessary to restrict the size or capacity of this type. In fact, closer regulation in respect to the chosen voltage will be obtained in the larger machines. One of the outstanding advantages in placing the poles in tandem is the fact that a small diameter armature can be used and in consequence the amount of copper in the end turns, which do not contribute to the generation of current and act only as a dead resistance, is materially lessened. While there is a certain weight of dead copper in the space between the cores, it is nevertheless much less than that saved at the end turns. The commutation will be excellent. Instead of the long windings being detrimental, the fact that the regulating poles are fore-shortened in the commutating zones, leaving only the influence of the main poles, which are strengthened at this tip, causes a flux of the proper value to be present such that reactance voltages are neutralized and high short circuit currents under the brushes eliminated.

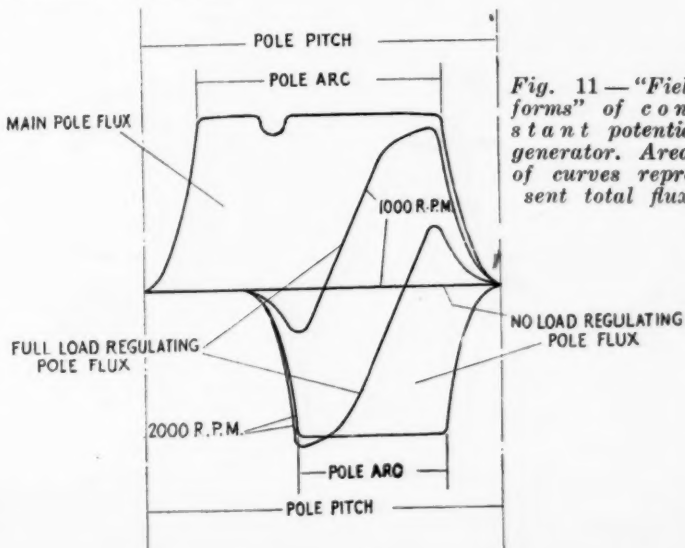


Fig. 11—"Field forms" of constant potential generator. Areas of curves represent total flux

Better Use of Available Labor Needed in Automotive Plants

No help likely from change in immigration law, says an important executive. Advises employee representation and encouragement of thrift. Decentralization of manufacturing is future possibility. Job analysis and reduction of labor turnover need constant attention.

By Norman G. Shidle

AUTOMOTIVE manufacturers will have to make better use of the labor they have, instead of depending on immigration to fill their need for workers, according to a leading executive of an important automotive manufacturing company who has given special attention to labor problems for a number of years. He considers better utilization of the existing labor supply the most important immediate manufacturing problem in the automotive industry.

This may be accomplished by breaking down various skilled jobs to their simplest parts, so that a man can be trained quite rapidly to do any one of the parts. It may be found profitable to decentralize manufacture somewhat, taking the work to places where an adequate labor supply is already available. There is a definite limit to the increase of efficiency possible through large scale manufacture in congested industrial centers. Efficiency gained through concentration of production and workers may be offset by high labor turnover and the excessive absenteeism caused by sustained high-tension efforts and unfavorable social conditions.

Believing the adjustment of human relationships to be a vital automotive production problem, this executive expressed many opinions of practical value in an interview given recently to *AUTOMOTIVE INDUSTRIES*. Besides the questions of better utilization of the labor supply and decentralization, he commented on the tendency to pyramid labor shortages, the need for closer job analysis and better planning, the importance of thrift plans in stabilizing work forces, and the necessity for some established means of contact between management and men.

HE has a sound reason for desiring his name withheld from publication in connection with his comments on current labor problems. He put it this way: "I get on very well with my wife. But she would probably resent my writing articles about it. The industrial relations work carried on by our organization is solely for the purpose of making possible constructive cooperation be-

tween the company and its employees. Were it used for publicity purposes, employees might rightfully become suspicious of its reason for being." The correctness of this opinion is borne out by numerous examples in the past both within and without the automotive industry. This executive's comments on current labor problems are summarized in the following paragraphs.

Automotive manufacturers can hope for no immediate help from changes in the immigration law. The present

Congress has done nothing about it. There will not be another session of Congress until next December. The 3 per cent law does not expire until June, 1924. Until then at least, no changes can be expected. Even then it is doubtful whether or not a letting down of immigration bars would be an unmitigated blessing to manufacturers.

Importation of great masses of labor during boom times requires provision for steady employment of those immigrants

brought in. If they are simply laid off when business slumps, a highly unfavorable social condition is created which reacts on industry as well as on the American public in general. Too few facts about labor needs are available at the present time. We do not have enough actual data to use as a basis for determining a really constructive immigration policy.

The thing to do is to stop worrying about immigration as far as the immediate industrial situation is concerned and bend our efforts toward a better use of the workers already available. This does not mean driving men harder, but rather utilizing more fully all of their possibilities. If labor turnover, absenteeism, and accidents were reduced to a minimum more work could be accomplished with a given number of men. Closer job analysis and better production planning will also help.

Automotive manufacturers have been used to a tide of immigration pressing at their gates so long that they have been prone to use their man power uneconomically.

Another current and periodic difficulty is the pyramid-

IN what manner is the labor shortage to be met in automotive manufacturing plants? What chances are there for a letting down of immigration bars and would such an act be beneficial to industry in the long run?

Executives will want to read what a man well informed on labor matters thinks of these problems. Such a man recently gave an interview to *Automotive Industries* and his opinions, which have a real practical value, are given in this article.

ing of labor shortage. Suppose one factory needs 300 workers. It may make a request from several sources for these men, asking for 300 in each case. If the request is made from two different sources, an apparent labor shortage of 600 men has been created.

This sort of thing always occurs when there is a need for men. It always results in exaggeration of the actual shortage. Its effect is to encourage "floating" among workers, to increase absenteeism, and to cause strong bidding for workers by various manufacturers. The wage inflation which results is not of permanent benefit either to management or men, since it is not based on a sound economic foundation.

The result of pyramiding shortages is a general hectic atmosphere of unrest, which, despite its intangible nature, increases production costs in many concrete ways.

Such an atmosphere is common in high production plants, even under the best conditions. High-tension activity on the part of executives and workers, continued over long periods of time, tends to breed dissatisfaction, both social and industrial. It is inherent in very large scale production, however, because the cost of a breakdown on any part of the machinery is tremendous. Consequently, every possible effort must be made to prevent such breakdowns, regardless of the cost.

It is difficult to determine just when the point is reached where the ill effects of large scale production outweigh the increased efficiency gained by it. Experience in several instances does indicate that there is such a point.

The future may develop a larger number of smaller manufacturing units, even within large corporations. These small units may be established where a suitable labor

supply is available. Parts may be manufactured in the small plants and shipped to main plants for assembly. One large company making an automobile part is already investigating very seriously the possibilities of such development within its own organization.

Regular means of contact between management and employees is essential to efficient production whether the plant be large or small. The worker likes to feel once in a while that he can tell the boss where to go without getting fired for it. When the employee has that privilege he doesn't care much about exercising it. But when he doesn't have it, he is likely to feel "exploited."

Settling Small Difficulties

Troubles and grievances arise in every manufacturing plant. Most of them are petty in character. If normal machinery is provided for the expression of these grievances, 99 per cent. of them can be settled without difficulty. If the employee has no established way to air his troubles, however, he will brood over them and talk to his fellow workers about them, until they grow to be matters of tremendous importance in his own mind.

A man with a grievance is going to talk about that grievance under any circumstances. It is a wise management that makes it easy and pleasant for him to do his talking in the front office. It is sometimes objected that when such contact is established the employees "ask the darndest questions," some of which are very difficult or perhaps embarrassing to answer. The reply to such objection is readily available.

"If you are not big enough to lead the bunch, you aren't big enough to be the manager."

A New Type of Viscometer

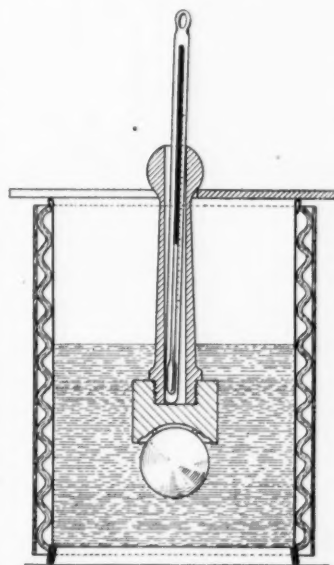
A NEW viscometer, the Michell cup and ball type, has been developed and placed on the market in England. It consists of a hardened steel ball 1 in. in diameter, and a hardened steel hemispherical cup at the end of a hollow handle forming a thermometer pocket and provided at the other end with a round gripping device formed of vulcanite. The spherical surfaces of both the ball and the cup are correct to within 1/10,000 part of inch. The cup is formed in a lens-grinding machine and while the metal is in the soft state is impressed by a hardened ball in which three small blind holes have been drilled. This ball when in the cup is struck with a hammer, with the result that three small pips are raised on the concave surface of the cup. These have a diameter of about 1/16 in. and when finished by grinding have height of one to two thousandths of an inch, this height determining the constant of the instrument. The mouth of the cup is counter bored about 1/64 in. deep and about 1/64 in. wider all around than the undisturbed diameter.

In use, three drops or so of the oil to be tested are placed in the cup, which is then inverted and pressed down on the steel ball, with the object of bringing the faces of the pips and the steel ball into metallic contact. When this condition is reached there is a film of oil of definite thickness between the cup and the ball, except for the areas represented by the pips, and, in addition, a reservoir of oil held in the counterbore by surface tension. The cup and ball are now raised, and the time from the raising to the instant at which the ball drops

out of the cup is accurately observed. This time, divided by the constant of the instrument gives the viscosity in absolute units. To prevent heat from the hand influencing the result, the instrument is held throughout by the vulcanite knob.

When the cup and ball are raised the ball immediately begins to fall out of the cup, with the result that oil from the counterbore flows into the space between the ball and cup and thickens the film of oil already there.

The rate of flow into this space is a measure of the viscosity of the oil. Tests made on oils, the viscosity of which was accurately known, are said to have shown that the average error of the instrument is about 4 per cent. It is claimed that for shop tests of the viscosity of lubricants for instances, this new instrument is preferable to the efflux type of viscometers now in common use.



Michell cup and ball type
of viscometer

Rayfield Marketing New Carbureter with Floating Venturi

Latest product has concentric jets for intermediate and high speeds respectively and separate tube for idling conditions. Tapered metering pin attached to floating venturi controls size of high speed orifice. Dash adjustment replaces choke.

A NEW Rayfield carbureter of what may be termed the semi-plain tube type has just been put on the market. The carbureter incorporates a variable venturi and a variable jet both governed automatically by engine suction. The carbureter is provided with easy starting and idling feeds above the butterfly throttle. Cool air for summer conditions is admitted by a thermostatically controlled valve.

Normally gasoline is admitted to the mixing chamber through a double central jet consisting of two concentric tubes. The outer passage between the two tubes is fixed. This outer passage acts as the intermediate speed fuel jet. The inner passage through the center tube is regulated by a metering pin which rises and falls with the venturi valve. This is the high speed jet. There is a single air opening which admits air to and around the venturi throat which surrounds the jet.

With increasing speeds and vacuum, the venturi valve is lifted off its seat by the suction, drawing with it the metering pin, permitting gasoline to flow through the central jet and air to pass up through the central venturi throat. Finally, at full opening, the needle valve or metering pin has risen to such an extent that maximum flow is permitted through the central or high-speed passage as well as through the annular or intermediate speed passage.

When the engine is idling, with the throttle valve practically closed, fuel is not supplied from either the annular intermediate speed jet nor the central high-speed jet. Instead, it is drawn through a passage which is drilled in the body of the carbureter, leading from the supply of gasoline in the float chamber to a point above the throttle. An idling tube open at both ends is inserted in the vertical part of this passage, a hole being drilled into this idling tube near its upper end. This is the air bleed for the idling mixture. The passage surrounding the idling tube is open to the air through a drilled orifice, supplying the air for the idling air bleed. The idling mixture is controlled at the idling jet just above the throttle by an adjusting needle valve screw.

Special Dash Mixture Control

A special hand control on the dash is provided to supply an extremely rich mixture for easy starting. The lever on the carbureter actuated by the dash control is mounted on an eccentric. Rotation of this eccentric by means of the dash adjustment lifts, by means of a lever arm and yoke, the needle valve controlling fuel flow from the float chamber to the intermediate nozzle. The eccentric arm also operates the primer valve which controls the primer fuel passage. This passage is a vertical ex-

tension of the passage supplying fuel to the metering nozzle, and has its outlet above the throttle.

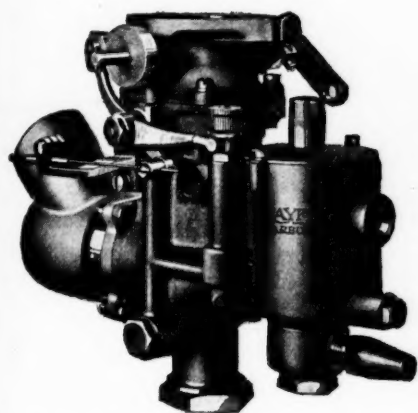
The primer valve is a round, brass bushing with a hole of the same diameter as the primer passage drilled across its center. When the dash adjustment is closed the valve shuts off the primer passage, but as the adjustment is pulled up beyond half its travel the hole begins to register with the passage and gradually opens the passage until it is wide open when the adjustment is pulled out all the way. When the dash adjustment is closed the hole in the primer valve lines up with a hole drilled on the outside of the body of the carbureter; this is an air vent which insures that the primer will be inoperative when the dash adjustment is closed. This dash adjustment takes the place of the usual choke. It acts as a primer when wide open and as a dash adjustment when partially opened, providing control of the mixture throughout the entire range.

Spray Nozzle Is of Conical Shape

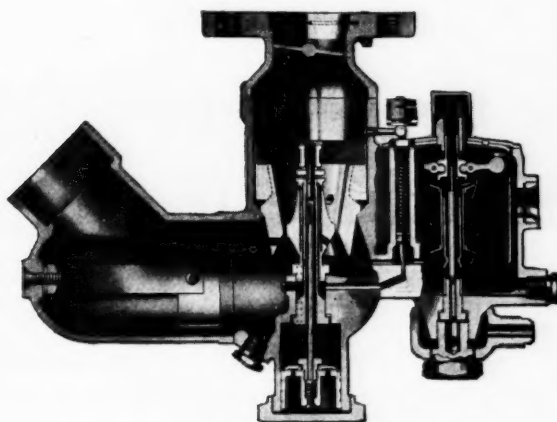
The spray nozzle is of conical shape on the outside at the point where the venturi tube is of the smallest inside diameter. This space between the cone and the venturi allows the minimum supply of air required at idling and lower speeds to be mixed with the gasoline drawn from the intermediate nozzle and the idling well. As the venturi tube is drawn up by the increased suction of the engine, this space between it and the cone increases and a gradually increasing air supply is provided around the venturi tube. The metering pin is fitted into the metering nozzle or high speed jet and is tapered toward its lower end from a point below the top of the nozzle. It is attached at the upper end to the venturi bridge so that it moves up and out of the nozzle as the venturi tube is drawn up. This causes both an increased supply of gasoline and an increased supply of air to take care of the needs of the higher speeds.

The shape of the venturi and of the cone surrounding the nozzle determine the actual air orifice at any speed. Thus, the proper mixture for any vacuum condition is pre-determined. The supply of gasoline to the metering nozzle is not only regulated by the steering nozzle itself but also by means of the high speed limit jet which is placed in the passage leading from the float chamber to the metering nozzle. This jet is removable and is made in various sizes, so that a large variation in the supply of fuel to the metering nozzle can be obtained by a combination of changes in limit jets and height of metering pins.

To insure a proper mixture through the entire intermediate range a cam is placed on one end of the throttle



External view of new model ST Rayfield carbureter



Sectional views through new Rayfield carbureter with automatic venturi valve and metering nozzle

shaft slightly eccentric thereto. As the throttle shaft is rotated, the cam acts against a roller follower, gradually lifting the needle controlling the flow from the float chamber to the intermediate passage, increasing the supply of fuel at higher speeds. The cam is made with a neutral point and is so placed on the throttle shaft that the point of contact with the roller at closed throttle is $\frac{1}{8}$ in. above or below the neutral point, depending on whether the throttle opens clockwise or counter-clockwise. When the throttle is opened slightly, therefore, the intermediate needle is partially lowered and as the throttle is opened farther the needle is again gradually lifted.

The wider opening of the intermediate needle at idling is provided in order that the passage will fill more quickly after being partially exhausted under open throttle. In this way more fuel is made available for acceleration. On most four-cylinder engines and on trucks the use of the cam will not ordinarily be found necessary. To control the movement of the metering pin and the rising and falling venturi, the metering pin stem terminates at a piston to which it is attached. The piston operates in a well of fuel acting as the dash pot. A sudden acceleration acts against this piston, increasing the vacuum and hence the fuel flow. The additional fuel for acceleration is available from the accelerating well, which is a reservoir formed in the passage drilled in the body of the carbureter in which the idling tube is placed.

Carbureter Action with Idling Machine

When the engine is idling, an excess of fuel flows into the well from the idling tube through a small hole drilled near the bottom of the tube. The instant the throttle is opened wide a high vacuum exists at the main nozzle of the carbureter and a high velocity of air past the spray nozzle results. The fuel in the well is immediately drawn back through the jets through which the well is filled into the idling passage and out of the spray nozzle. On a slightly opened throttle, however, this fuel will not discharge from the well because the vacuum is not sufficient to fully overcome the resistance in the hole connecting the idling tube and the well.

For cold air necessary when the engine becomes thoroughly warmed, or in hot weather, there is an automatic thermostatically controlled air valve set at 120 deg. Fahr. This is a plain, flapper valve mounted on the end of a piece of thermostatic metal. As the metal becomes warm it tends to curl inward, admitting cold air. Fuel is filtered through two screens. One is located in the gas strainer trap, which is removable by taking off the strainer trap retaining plug in the strainer trap, and the other on the intermediate adjustment side of the carbureter

and screens all of the fuel entering the dash pot. This can be cleaned by removing the dash pot strainer plug to which it is attached.

Two Main Adjusting Points Supplied

There are two main adjusting points on the Rayfield Model ST carbureter. One of these is for idling and the other for intermediate speeds. The idling adjustment is controlled by the needle valve located just above the throttle in the head of the carbureter. It controls the flow through the idling jet into the intake port just above the throttle.

Intermediate adjustment is controlled by a screw which regulates the flow from the float chamber to the intermediate nozzle. In installing a carbureter, this adjustment is made first. There is also a stop arm adjustment which regulates the closed position of the throttle. The stop arm adjustment provides a variable throttle opening for idling and, at the same time, allows a practically closed throttle position, so that the engine will idle when the throttle lever is closed all the way.

The above adjustments are in the hands of the service station making the installation. There is a factory adjustment on the metering pin as to height, but this need only be adjusted in adapting the carbureter to some particular engine and even then it is infrequent that it has to be changed. The metering pin height is adjusted by removing the dash pot nut, using a screw driver to take out the piston sealing screw which is in the center of the piston hub. A screw driver is then inserted into the notched ball at the bottom of the piston stem. Turning the stem to the left lowers the metering pin. One complete turn lowers the pin $\frac{1}{32}$ in. and is very effective. The adjustment is by quarter turns. Lowering the metering pin, of course, gives a later timing on the jet, delaying the point at which fuel is fed from the main or central jet.

The position of the metering pin can be checked by setting the carbureter to the proper mixture on the intermediate adjusting screw at one point and then trying it at another point to see if the mixture is proper at this second point. If too lean or too rich, it indicates that the needle valve has been set too low or too high. This adjustment is very seldom required. A further control of the operation is by changing the high speed jet, which is also a factory adjustment.

THE National Advisory Committee for Aeronautics has published the second part of the article on "The Altitude Effect on Air Speed Indicators" by H. N. Eaton and W. A. MacNair of the Bureau of Standards. They appeared in Reports No. 110 and 156. Copies may be obtained by application to the committee.

Greater Care in Original Design Will Reduce Foundry Cost

Engineers should have thorough knowledge of molding practice. Type of construction chosen may make enormous difference in expense. Pattern-maker's role becoming more important daily.

By R. C. Hitchcock*

THE relation between pattern shop and foundry has always been very close since the pattern shop is the toolroom of the foundry, so to speak, and the results of the work of this department are directly felt in every operation in the foundry.

If a pattern is made in a way that simplifies the design of the mold, the work of making the molds is greatly reduced, and if the core work is so arranged that cores can be made rapidly and accurately, both the coreroom and the foundry molding floors benefit. When conditions in making the molds and cores are successful, we may look for reduced costs in the cleaning room and for more happy relation in the machine shop.

A good starting point in talking about patterns and their effect in the foundry would be to say a few words in regard to the engineer's work on patterns. The engineer's knowledge of how his design is going to assume shape will influence him greatly in trying to eliminate and revise little details that many times are just as effective in the general design one way as another.

For example, take a casting that might be designed to brace in between a series of bearings and which would present a lot of problems as to the direction of strains. The natural tendency would be to want to put in a reinforcing rib here and there with little thought as to just what it might mean to produce a cavity in sand to get the casting and to reinforce and carry all the possible little projections of the different parts of the mold that would result from this not too well thought-out ribbing. This does not mean that ribs and projections are not good design, for properly used they can be very effective and still not increase greatly shop practice difficulties.

Care in Design

If the engineer after roughing up a design will try to picture in his mind a possible parting line for a mold of his job and will then remember that his mold will be made in two halves he will realize easily that it will be well to keep the upper half as plain as possible, thereby giving all the strength to the sand in this part of the mold.

The pattern-maker of today is playing an ever greater part in the new rôles of modern foundry practice and our rapidly increasing quantity production. He must now more than ever keep in closest touch with the foundries where his patterns are used and be ever on the alert for little details to improve production. He is also called

upon more than ever to help make decisions through the closest cooperation with the foundry as to the manner of pattern equipment different jobs require. In making decisions of this kind, there are various factors he must consider which have to do with the expense to be incurred and the quality and quantity of results required.

Complications Are Costly

Another way in which the pattern-maker of today is called upon to exert his influence is in the design of his equipment for the more complicated types of castings. It is here that the foundries have their chief difficulties in quantity production. Complicated castings as a rule have more or less core work in their make-up. Good design permits a simple and accurate assembly of the cores in the mold combined with the maximum possible strength of core structure to aid in resisting the influence of the metal on entering a mold. The effect that molten metal has on all suspended structure in a mold is to float it, since all metals with the exception of aluminum are so very much heavier than core work.

A very good illustration of the things that must be thought of in complicated core work is given by analyzing internal combustion motor cylinder work, for this class of work involves difficulties which not many years back were thought to be insurmountable. Engineers, in their search for improvements in this field, have seemed to know no limit in the complication of their designs.

Another item of importance which does not have to do with the pattern shop's relation to the foundry or engineer directly, but very indirectly, is the pattern shop's relation to the pattern buying public. There is a very false tendency in buying patterns to want to buy to price or to contract, and I think I can safely say that not 5 per cent of the people who buy patterns have the knowledge of what they will get for their money to enable them to distinguish a bargain. Patterns can be made in many different ways, each way entailing a certain expense and the choice of these methods left, as a rule, to the pattern-maker. Hence these costs are devoid of opportunity for comparison in relation to what course will be followed.

As to the effect of this on the engineer and foundry. First, in the case of the engineer, who is interested in the final success of his work, properly or improperly made patterns can influence his results a great deal. Second, in the case of the foundry. Here is where the real effect is felt, because a pattern shop is a toolroom to the foundry and its influence is felt in all that it does. If the pattern shop's movements are controlled by price rather than a high ideal for results, the foundry must suffer.

*Proprietor, Modern Pattern Works, Minneapolis. Digest of paper presented before Minneapolis Section of Society of Automotive Engineers.

An Analytical Study of Crank-pin Bearing Design and Lubrication

Part II

Fundamentals of lubrication are briefly stated because correct bearing design depends largely upon a knowledge of these laws. Most effective method of bearing temperature control is to maintain perfect lubrication.

By G. D. Angle

In charge airplane engine design, McCook Field

IN dealing with the lubrication of crank-pin bearings the fundamentals of lubrication, as set forth by various investigations, will be briefly summarized. This is to be followed by some original data dealing with crank-pin oil-hole location and the effects of feeding oil to a crank-pin bearing in the conventional manner by the intermittent communication of oil holes.

The friction between the journal and bearing while under load absorbs some of the power developed in the engine, converting it into heat and increasing the temperature of the bearing. If the bearing temperature rises sufficiently, the bearing will burn out. A thorough investigation of crank-pin bearing lubrication, therefore, makes it necessary to regard the factors governing the friction developed, and the heat generated therefrom; also, to determine the ability of the bearing to dissipate this heat, and the causes and effects of bearing wear. In considering the laws of friction, a distinction is made between the friction of dry or unlubricated surfaces, imperfectly and incompletely lubricated surfaces, and perfectly lubricated surfaces.

Wear occurs between all dry or unlubricated surfaces that rub together, the amount of wear depending mainly upon the metals in contact, and being additionally controlled by the load, speed, and nature of the surfaces. The frictional loss in dry metal bearings is generally quite large; the coefficient of friction is about 0.15, although values as low as 0.06 can be obtained under certain conditions of load and speed with special anti-friction metals. All the heat generated on a bearing metal by dry friction must be dissipated entirely through the bearing.

On the other hand, with perfect lubrication, there is only fluid friction, which is due to the layers of lubricant sliding over each other. The journal and bearing are then completely separated by a thin film of lubricant which eliminates any possible wear upon the bearing surfaces.

Coefficient of Friction

The coefficient of friction in a perfectly lubricated bearing depends upon the speed, load, and absolute viscosity of the lubricant. The values are usually about 0.006, although a coefficient of friction as low as 0.001 can be obtained in bearings of a special type. Since the heat in a perfectly lubricated bearing is generated within the fluid,

it follows that the greater part of it can be dissipated by the lubricant after it leaves the bearing, provided sufficient circulation is maintained. Some of the heat, of course, must be dissipated by the metal surrounding the bearing.

Imperfect or incomplete lubrication exists when the oil film is not completely formed and the journal and bearing are only partially separated by the lubricant. The wear under these conditions depends upon the degree of separation, the character of the surfaces, and the kind of lubricant employed. The coefficient of friction is consequently a variable quantity, approaching that of perfect lubrication when the oil film is nearly complete, and that of dry friction when the lubricant has been expelled from the bearing surfaces. Frictional heat is then generated both in the lubricant and on the surfaces in contact. If a condition of imperfect lubrication is long sustained, the bearing must dissipate the major portion of the heat, as very little of the oil supplied to the bearing finds its way to the place where the greater part of the friction is developed.

Necessity of Perfect Lubrication

Perfect lubrication is desired in order to minimize the loss of power and wear on the bearings due to friction. It will now be shown, in a study of the heat generated by friction and the heat dissipating qualities of a bearing, that perfect lubrication is essential for continuous operation under the usual loads and speeds employed in airplane engines.

Lasche experimentally determined the amount of heat that a bearing will directly radiate, the results of his investigations being shown by the curves of Fig. 8, in which the heat radiated—expressed in foot-pounds per second per square inch of projected bearing area—is plotted against the difference in temperature between the bearing and the surrounding atmosphere. The amount of heat generated—expressed in the same units used in Fig. 8—is equal to the product of the rubbing factor (average bearing-pressure in pounds per square inch on the projected area times rubbing velocity in feet per second) and the coefficient of friction.

The bearings employed by Lasche in his investigations were encased in large masses of metal, which rendered them capable of dissipating more heat than the bearings

used in airplane engines. It will be observed from curve No. 2 of Fig. 8, which corresponds to the type of bearing that cools best, that a bearing will radiate to the surrounding atmosphere about 9 ft.-lb. per sec. per sq. in. projected area with a 100 deg. temperature rise. The average coefficient of friction with perfect lubrication and probably the minimum maintained with imperfect lubrication is about 0.006. Take, for example, a case where the temperature rise and coefficient of friction are the same as mentioned above, we find that the radiating capacity of the bearing will only provide for the heat generated at a rubbing factor of 1500. This is less than one-tenth the value of rubbing factors commonly maintained at the crank-pin bearings of modern airplane engines. Should the temperature rise exceed 100 deg. Fahr. under the usual load conditions, there is increased danger that the white metal will flow from the bearing; therefore it is evident that additional cooling means must be provided.

The most effective method of controlling the temperature in a bearing is to maintain the conditions of perfect lubrication and circulate more oil than is required to provide these conditions. In this way the heat of friction is being continually generated in fresh lubricant and then carried away in it. Experience has shown that this is the only practical means of treating the problem as applied to airplane engines.

Quantity of Oil Required

The quantity of oil that must be supplied per second per square inch of projected bearing area can be computed by the equation

$$(12) \quad q = \frac{f_r \times \mu}{778 \times \Delta t \times \epsilon}$$

q = quantity (lbs.).

f_r = rubbing factor.

μ = coefficient of friction.

ϵ = specific heat of oil.

Δt = temperature rise of the oil in the bearing (F.).

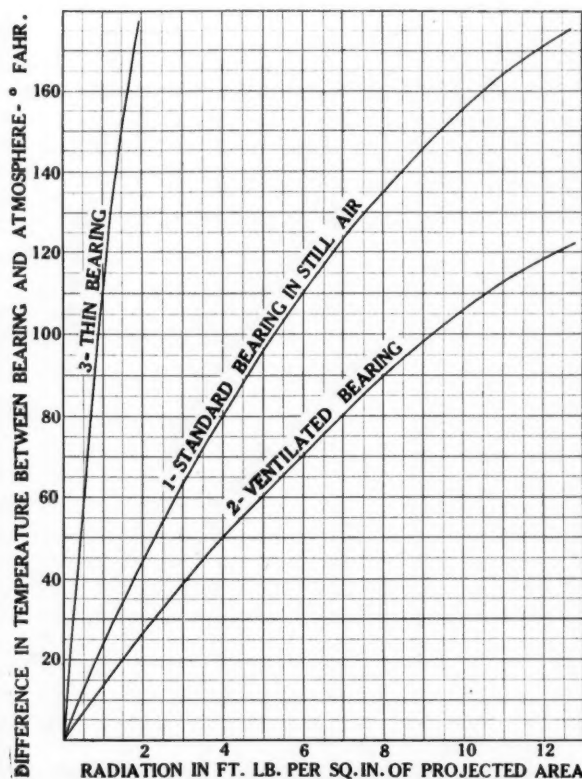


Fig. 8—Quantity of heat radiated by a bearing as determined experimentally by Lasche

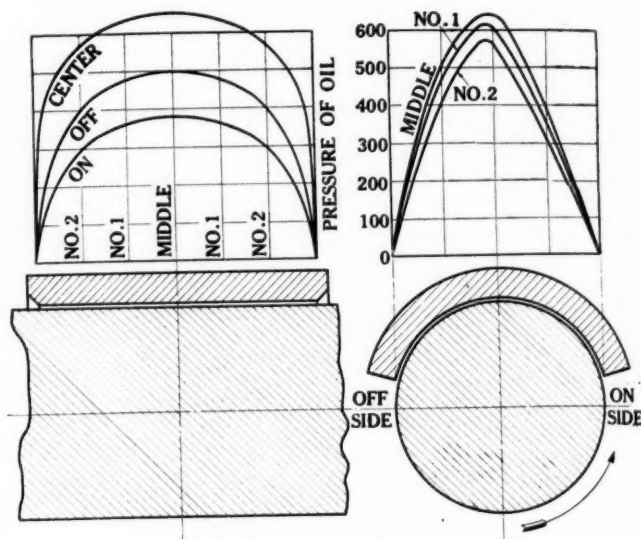


Fig. 9—Distribution of pressure in an oil film as determined by Tower

The value of q is computed for a typical case in which the following assumptions are made: rubbing factor (f_r) = 18,000; coefficient of friction (μ) = 0.006; specific heat of the oil (ϵ) = 0.45; temperature rise of the oil in the bearing (Δt) = 100 deg. Fahr.

$$q = \frac{18000 \times 0.006}{778 \times 100 \times 0.45} = 0.0031 \text{ lb. per sec. per sq. in. projected area.}$$

Not all of the oil supplied to a crank-pin bearing is effective in cooling, as that which may leak out the ends of the bearing without passing between the surfaces under pressure conducts but very little heat. The amount of end leakage depends upon the ratio of bearing length to diameter, the rubbing velocity, rigidity of the bearing, the quantity of oil supplied, the oil pressure maintained, the method of introducing the oil, and the distance of the oil hole from the end of the bearing. Since excessive oil flow from the crank-pins causes over-oiling of the cylinders, which in turn results in a large consumption of oil and fouling of spark plugs, we are confronted with the fact that end leakage may limit the cooling and therefore the rubbing factor.

A rubbing factor of 20,000 has been previously mentioned. At the present time this value is being maintained satisfactorily in a bearing of approved design, but it is apparently about the maximum value that can be safely used with the existing design knowledge on the subject. In some of the earlier engines in which the lubricating problems had not been so carefully treated, rubbing factors of about 6000 appeared to be the limit. Incidentally the latter value is about the maximum used in bearing designs of other classes of machinery.

Frictional Losses in Liberty Engine

In order to convey some idea of the quantity of oil supplied and the probable temperature rise of the oil while passing through the bearing, an analysis is herein given for the Liberty-12 engine as an example. The total friction loss—exclusive of pumping losses—in the Liberty-12 engine at 1700 r.p.m. is approximately 30 hp. About 60 per cent of this friction is developed by the pistons, 10 per cent by camshaft and auxiliary units, 15 per cent at the main bearings, and the remaining 15 per cent at the crank-pin bearings. The frictional loss of the six crank-pin bearings is therefore about 4.5 hp., or .75 hp. per bearing.

The frictional loss per bearing can also be determined by the following equation:

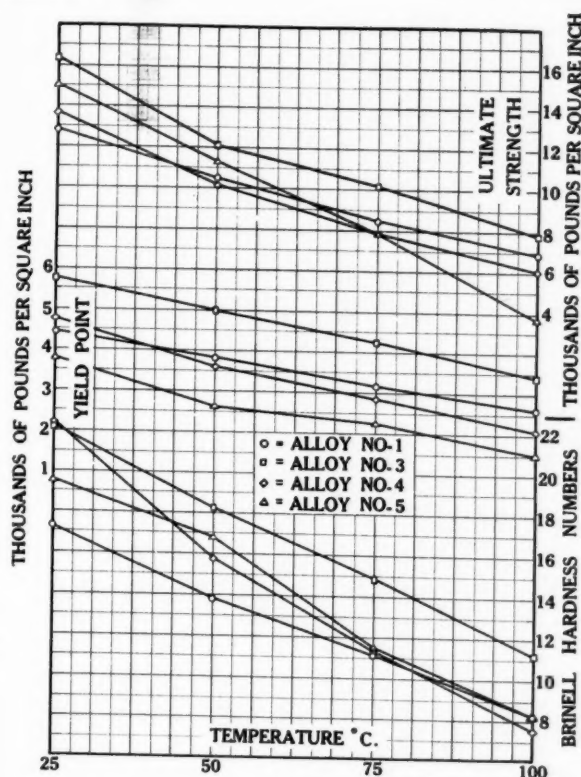


Fig. 10—Properties of white metal bearing alloys at elevated temperatures as determined by the Bureau of Standards

$$(13) \quad F = \frac{a \times f_r \times \mu}{550}$$

when F = frictional loss expressed as hp.
 a = effective projected area.
 f_r = rubbing factor.
 μ = coefficient of friction.

In the case of the Liberty-12 engine, in which (approximately) $F = 0.75$ hp., $f_r = 13,200$, and $a = 5.2$ sq. in., we can compute the coefficient of friction from equation (13) as follows:

$$\mu = \frac{550 \times .75}{5.2 \times 13200} = 0.006$$

The quantity of oil passing through the Liberty-12 engine is 1.2 gal. (8.7 lb.) per minute, of which one-half can be assumed as flowing through the crank-pin bearings. The projected bearing area of each crank-pin is given above as equal to 5.2 sq. in. Therefore the quantity of oil supplied per second per square inch of projected area is

$$q = \frac{.50 \times 8.7}{60 \times 6 \times 5.2} = 0.00232 \text{ lb.}$$

The rise in temperature of the oil (Δt) can now be computed by substituting values in equation (12) as follows: $q = 0.00232$, $f_r = 13,200$, $\mu = 0.006$, and $\epsilon = 0.45$.

$$\Delta t = 0.00232 = \frac{13200 \times .006}{778 \times \Delta t \times .45} = 98 \text{ deg. Fahr.}$$

The temperature of the entering oil is about 120 deg. Fahr.; therefore, the usual temperature of the oil in the crank-pin bearings of the Liberty-12 engine is approximately 220 deg. Fahr.

A rotating shaft will draw the lubricant in between the journal and the bearing by virtue of molecular attraction between it and the lubricant combined with the viscosity of the lubricant. When this action is sufficient to form a film of oil under pressure capable of sustaining the load on the bearing, lubrication is considered perfect.

*"Some Properties of White Metal Bearing Alloys at Elevated Temperatures." No. 188 Technologic Paper of the Bureau of Standards, Washington, D. C., April 5, 1921.

Mr. Beauchamp Tower, while experimenting with journal friction, determined the distribution of pressure in an oil film by drilling holes at various points of the bearing brass and connecting these to a pressure gage. His experiments showed the distribution of pressure to be as shown by the diagrams of Fig. 9, the magnitude of the oil pressures being such that the resulting upward force balances the load on the bearing. He found that the maximum oil pressure occurred near the middle of the bearing under load, and that this pressure was much greater than the bearing pressure as determined by dividing the total load by the projected area. The relation between the maximum oil pressure and the bearing pressure depends upon the load, the rubbing velocity and the viscosity of the lubricant, as well as the length of the bearing. The maximum oil pressure is at least twice the bearing pressure in the usual crank-pin bearing; hence a white metal must be chosen that has a yield point at operating temperatures which exceeds the maximum oil pressure.

In Fig. 10 are given the Brinell hardness, yield point, and ultimate strength of various white-metal alloys as determined by the Bureau of Standards.* For the composition of the metals tested see Table IV. No curves are given for alloy No. 2, because it has little value as a bearing metal, due to its rapidly lowering yield point at increased temperatures, although at normal temperatures it has a yield point a trifle higher than alloy No. 3. The yield point of these alloys was not noticeably affected by prolonged heating at 212 deg. Fahr., except alloy No. 5, which has a high lead content.

TABLE IV

The Percentage Composition of White Metal Bearing Alloys Studied by the Bureau of Standards

Bearing No.	Copper	Antimony	Tin	Lead	Iron
1	4.56	4.52	Remainder	None	.05
2	3.51	7.57	"	"	.05
3	5.65	6.90	"	.09	.05
4	2.90	10.50	"	25.05	.05
5	...	10.03	"	84.95	.05

A certain relation must exist between the bearing pressure, the rubbing velocity, and the absolute viscosity of the lubricant in order to permit the pressure film for perfect lubrication to form. This relation varies for different bearings, being dependent upon the design, condition of the bearing surfaces, and the clearance between the journal and the bearing.

Region of Perfect Lubrication

In an investigation of the region of perfect lubrication for a particular bearing that was extremely rigid—no perceptible distortion existing with the range of loading applied—it was found that the value of the coefficient of friction (μ) was determined by the relation between the bearing pressure (P), the revolutions per minute of the journal (N), and the absolute viscosity of the oil at the film (τ). Plotting the value (μ) versus $P/N\tau$, the definite curve shown in Fig. 11 was obtained. This curve is continuous for the region of perfect lubrication, μ decreasing with the quantity $P/N\tau$, until a value of the latter quantity is reached at which the film is broken and perfect lubrication no longer exists. From the point where the oil film breaks down, which is generally known as the seizing point, the rate of increase in the coefficient of friction is very rapid. Curves similar to Fig. 11 can be drawn for any bearing within the region of perfect lubrication when the range of loading does not induce distortion.

It is evident from this curve that the load a bearing can withstand and still maintain perfect lubrication depends solely upon the product of journal speed and the

absolute viscosity of the lubricant at the film in the bearing; also that the capacity for load at slow speeds is small. Furthermore, it can be seen that, neglecting the effects of distortion on the bearing, the loading capacity would be indefinite if the product of r.p.m. and viscosity could be held proportional to the load. Fig. 11 shows that the coefficient of friction is a minimum at the seizing point, hence the minimum friction is not compatible with maximum safety. The allowable safe value for the expression $P/N\eta$ depends upon the place in the curve where the seizing point occurs. If this value is very small, the coefficient of friction and the frictional losses are comparatively great.

Although the curve (Fig. 11) shows what occurs during the region of perfect lubrication, it has its limits when an attempt is made to apply it directly to bearing design, owing to the fact that the absolute viscosity of the lubricant at the oil film is unknown. The viscosity of the lubricant depends to a great extent upon the temperature, the values of the latter being difficult to ascertain. The variation of absolute viscosity with temperature of typical lubricants is shown by Fig. 12, from which it is observed that a slight difference in temperature has a marked effect upon the viscosity. The temperature of the bearing rises with the increase of journal speed, and at present there appears to be no simple way of directly determining the relation between the speed and absolute viscosity of the lubricant at the oil film.

When the distortion of a bearing under load is sufficient to take up the clearance between the bearing and the journal, the condition of metal contact exists over small areas. The resulting increase of friction causes an appreciable rise in temperature and thereby decreases the viscosity of the oil in the bearing. In some cases this decrease in viscosity lowers the capacity of the bearing for carrying load to the extent that the entire oil film may be broken.

Increasing the clearance of the bearing to provide for greater distortion causes the seizing point (see Fig. 11)

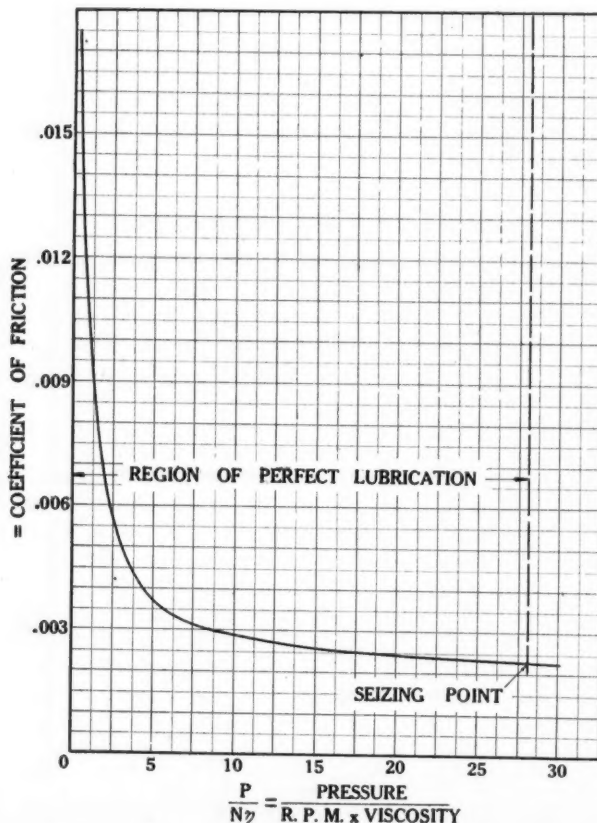


Fig. 11—Curve for region of perfect lubrication

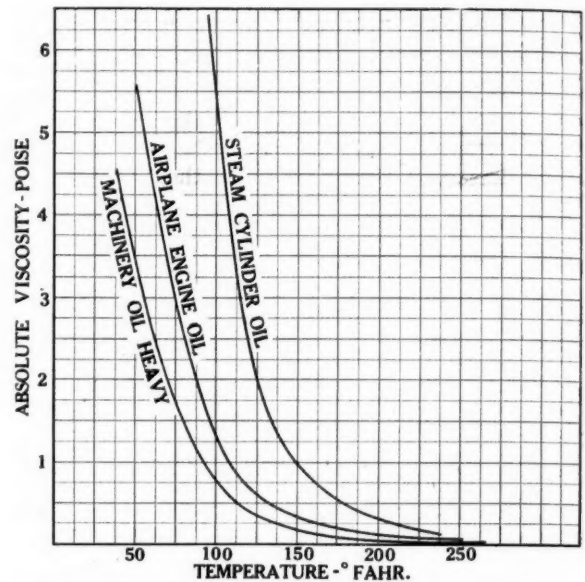


Fig. 12—Variation of absolute viscosity with temperature of typical lubricants

to occur at a lower value of $P/N\eta$. The minimum value of the coefficient of friction is then increased, and the allowable load for a given speed and viscosity is accordingly decreased. From the foregoing discussion the following facts are therefore apparent: The load capacity of a bearing is greatly influenced by its rigidity; the clearance allowed between the journal and bearing should be sufficient to provide for any distortion of the bearing under load; clearance, in addition to that dictated by the rigidity of the bearing, decreases the capacity of the bearing for carrying load and increases the minimum value of the coefficient of friction.

There are no rules at present to assist the designer in predetermining the allowable clearance. The amount of clearance in crank-pin bearings is generally governed by experience, the present practice for crank-pin bearings varying from 0.0015 to 0.0045 in. on the diameter. When wear has increased the clearance from 0.002 to 0.003 in. over the design value, it is usually necessary to refit the bearings.

FIVE "Service Manuals Covering Electrical Equipment for Motor Cars" from 1912 to 1921 inclusive have recently been published. These manuals contain both internal and external wiring diagrams, tests and performance data. Each type of starting motor, generator, cutout and regulator is illustrated by a separate and large diagram. The internal connections are easily followed because each motor and generator is diagrammed from the commutator end. The wiring of the cutout or regulator and the ammeter and battery are also shown on the same page thus giving the entire charging circuit.

The indexing method is very complete. Car equipment tables give the name of the car, model, year, make of equipment, type of generator, regulation, type of starting motor, setting of the generator, drives, test data and description of the starting motor. A separate list is also given of each make and type of generator and starting motor so that if the car model name is not known but the number or type of generator or starting motor is, the information can be found very easily.

A battery table furnishes the make, type, voltage, ampere hour, capacity, dimension and type number of the battery used on each car.

The manuals are published by the American Bureau of Engineering, Inc., 2632 Perry Avenue, Chicago.

Correct Steering System Layout Prevents Wheel Wobble

Problem of correct design of vital importance for safety considerations. Slack brought on by wear one cause of wobbling. Study of influence of unbalanced forces set up in front wheels may bring forth some explanations. Universal interest in subject.

By Cornelius T. Myers*

OF the multifarious compromises which must be effected in automobile chassis design, those which affect the steering mechanisms are of large importance and worthy of much careful study. Many an otherwise clean piece of automobile architecture can be more or less severely criticized when the steering layout is carefully analyzed. These mechanisms constitute a really large problem in chassis design, because they must not interfere with the many others in front of and just behind the dash; they must be easily assembled and dismantled, they should afford the maximum of access to and for dismantling adjacent parts, and, most important of all, they must afford safe and sure control of the direction of the car at all times.

In respect to safety, effective brakes rank first in importance and steering mechanisms a close second.

A recent editorial in AUTOMOTIVE INDUSTRIES referring to the violent wobbling of the front wheels under certain conditions, has turned the spotlight on steering mechanisms by asking the question, "What Makes 'Em Shimmy?" What this expression lacks in dignity it gains in pertinence; and it is gratifying to note that there is no lack of opinion among the engineers of the industry as to the cause and its cure, which should be readily effected.

Having listened to and read with great interest the views of several well qualified to speak on the subject, the writer offers to the discussion two or three explanations not heretofore advanced, and which it is hoped will be of some service.

First: A feature of major importance in the layout of a steering mechanism is the relation of the path of travel of the ball on the steering knuckle arm when under the influence of spring vibration, to the position of the ball on the arm of the steering gear itself.

Figs. 1, 2, 3 and 4 are typical layouts showing two lines

of travel for the steering knuckle ball, and the axle itself as the springs deflect. The axles, with their knuckle pivots, follow the lines *xx* due to the flexure of the springs. The balls on the steering knuckle arm, in each case, however, follow approximately the arcs *yy* which have for centers the centers of the balls on the steering-gear arms.

It is seldom that these two arcs coincide for any appreciable distance, and in same cases, as in Figs. 1 and 2, they diverge considerably as the axle is raised or lowered with respect to the frame when the springs flex. In looking at the Figs. 1, 2, 3 and 4 note that the arc *xx* in each case is the path of the center of the ball on the steering knuckle arm provided the steering knuckle is held so that it cannot turn about its pivot, and provided the ball is not connected to the steering-gear arm by the drag link.

But actually the ball cannot follow this path because it is connected by the drag link to the ball on the steering-gear arm. It must swing, in a vertical plane, through an arc centering about the ball *S* on the pitman arm of the steering gear, and also in a horizontal arc about the center of the steering pivot on the axle.

Referring now to a plan view, Fig. 5—*P* and *Q* are the steering pivots held by the ends of the axle, *B* is the ball on the steering-knuckle arm of the axle and is connected by the drag link to the ball *S* on the steering-gear arm. *C* and *D* are the clevis pivots at the ends of the tie rod.

Assume that the left wheel, striking a bump, rises. The point *P* on the axle, traveling along the arc *xx* (Fig. 1), reaches the point *P'*, Fig. 5. The ball *B* on the steering-knuckle arm moves along the arc *yy*, Fig. 1, and reaches *B'*, Fig. 5. Thus the wheel spindle which was normally in the position *PM*, now takes the position *P'M'*, and the clevis *C* moving to *C'* changes the position of the right wheel spindle from *QN* to *Q'N'*. Thus with the steering layouts, as in Figs. 1, 2 and 4, any rise of the left wheel will tend

THE accompanying paper written by Cornelius T. Myers, consulting engineer, contains many pertinent comments on the much discussed question of wheel wobble. It was received by AUTOMOTIVE INDUSTRIES last October when the subject first was widely considered, but unfortunately was not published at that time.

Several of the ideas advanced by Myers as well as by other engineers, were incorporated by Herbert Chase into the paper on steering system design presented by him at the winter meeting of the Society of Automotive Engineers.

AUTOMOTIVE INDUSTRIES sincerely regrets this occurrence and publishes Myers' article as originally intended to set forth as fully as possible an exposition of an important problem in motor car design.

*Consulting Engineer, Rahway, N. J.

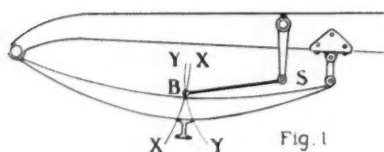


Fig. 1

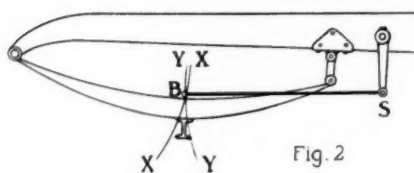


Fig. 2

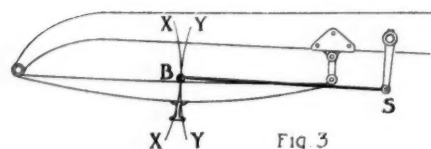


Fig. 3

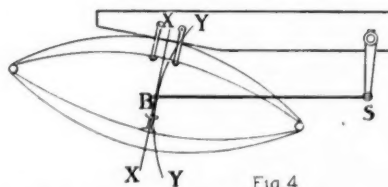


Fig. 4

Figs. 1 to 4—Diagrams of various steering layouts showing relative positions of spring in relation to drag link and steering arm. The more nearly the arcs xx and yy coincide the less is the tendency of the wheels to wobble under the influence of spring action

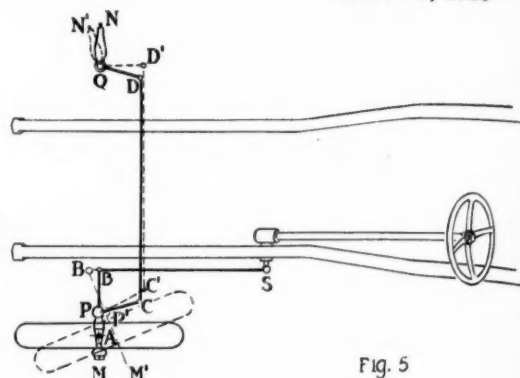


Fig. 5

Fig. 5—Diagram showing relative position of parts when wheels are in straight ahead (full lines) and deflected (dotted lines) positions

to turn the car to the left and a fall of the left wheel will tend to turn the car to the right. With a layout as in Fig. 3 this action will be modified and much diminished, the car tending to turn to the right whether the left wheel rises or falls.

Under certain road and speed conditions this action will cause the wobbling and resultant "shimmying" to which reference has been made. Some cars have a greater tendency to wobble than others, due largely, as will readily be seen, to the varying rates at which the paths xx and yy diverge in any particular steering layout.

Second: The other feature bears on the first one, just demonstrated, and in the writer's experience it accounts for the astounding violence of this wobbling at times. Wobbling seems to be the greatest when there is a quite perceptible amount of wear in the steering pivot bushings, wheel bearings and other points of wear or possible looseness. When successive bumps or depressions in the road surface synchronize with the taking up and giving out of the total amount of wear or slack, the wobbling seems to be most severe. It is somewhat analogous to snapping a whip, or more directly to a chain in which the links are long in proportion to their width. The end links suddenly reverse their direction of motion when the chain is snapped like a whip, for they receive a violent check when, having attained some velocity, the slack suddenly reaches its limit and the reaction causes a partial reversal. If the grasped end of the chain is reversed at the right moment the free end can be kept swinging from side to side in a regular period of vibration. The stresses in the chain will be greatly increased if a weight is attached to the free end, and the analogy of the return ball on a rubber cord is also apparent.

IN an automobile the links of the chain are the various parts and their connections, namely: Wheel hub bearing races, axle spindles, steering pivots and their bushings, the various pins and links in the steering mechanism, the spring bolts and their bushings. The ball on the end of the "chain" is the front end of the frame with engine, radiator, etc.; or the engine itself, if it is at all loose on its fastenings. When a series of road bumps synchronizes with the vibration period of the springs, and this period is some harmonic of the whipping "chain" of loosely connected parts, "she shimmies," and sometimes with a vengeance.

Third: A point on which the writer is still experimenting, is the influence of the unbalanced forces set up in the front wheels by the weight of the tire valves and adjacent parts. Due to the fact that the wheel spindles are not horizontal, these unbalanced weights move from and toward the chassis as the wheels revolve.

It would appear that when the position of the valve in

the left wheel bears a certain relation to the position of the valve in the right wheel, the forces set up as these valves revolve will counteract and tend to balance out. On the other hand, the relative location of the two valves might be such that the two forces were additive.

If there is looseness in the steering pivots and connections, and the speed of rotation of the wheels is such that these forces act in harmony with the "whipping chain" mentioned above, it seems altogether possible that they can either produce and intensify wobbling or intensify it when produced by some slight road inequality. The writer has known bad cases of wobbling to start on comparatively smooth concrete roads when the car was driven in one direction, but no wobbling occurred when driving over the same stretch in the opposite direction at the same speed. Turning the car around changed the relative position of the two tire valves, and evidently caused a balancing out of forces that had previously promoted and aggravated the condition.

THE conditions under which the violent wobbling takes place depend upon quite a number of different factors: The steering layout, the inequalities of the road, the vibration period of the springs, the speed of the car, the weight of the front end of the car, its moment of inertia about a vertical axis, the tire inflation, wear and looseness of front axle and steering-gear parts, etc. It is not easy to simulate these conditions, and often minor changes of one kind or another seem to cure the trouble; but it is latent if the steering mechanism is not correctly laid out, and will reappear under somewhat different conditions than at first.

In driving a car which has a recurrent tendency to wobble badly, the writer has found that turning steadily and not too sharply to one side or the other will check the phenomena if it is not allowed to become too violent. As a rule it is best to drive on the right side of a crowned road so that one must continually exert a little left-arm pull on the steering wheel to keep a straight course. This takes the slack out of loose steering connections, and obviates any wobbling due to looseness only. A further turning toward the left or crown of the road will take up any slack produced when wobbling is started by impressed vibration from road bumps, and will often damp out the wobble before it becomes severe.

In AUTOMOTIVE INDUSTRIES of Oct. 5, 1922, appears an article entitled "Wheel Wobble and Other Steering System Faults," by A. Ludlow Clayden, who sets forth several points with reference to steering mechanism that can certainly be given close attention.

It is particularly gratifying to note his denial that a transversely raked steering pivot makes for easy steering, even when the extension of its axis touches the ground

plane at the central point of tire contact. This practice is seldom used in the United States, and with good reason, but it has a number of foreign adherents who are loud in their claims for it.

In connection with transversely raked steering pivots, however, it is hard to believe that Clayden is correct when he states that front wheels are in unstable equilibrium when they are pointed straight forward; also when he states that with the drag link disconnected the wheels would swing against the frame of the car either in one direction or the other. Referring to Fig. 6 (his Fig. 4b), the point A on the spindle, whether the wheel is turned in or out, moves in a circle the plane of which is perpendicular to the axis of the steering-spindle. Thus, no matter in which direction the car is turned, in the view shown, the point A moves along the line AY perpendicular to the axis of the steering pivot. This movement tends to lower the wheel and raises the car, so that the front wheels, uncontrolled by forces exerted through the steering mechanism, tend to point straight forward and become stabilized in that position, under the influence of the weight of the car. Cars with such a steering mechanism have a considerable tendency to be self-righting, but with any looseness in pivot bushings and steering connections, the wheels can set up a violent and persistent wobbling once the right conditions are encountered.

Clayden's theory, that the tendency to raise or lower the wheel when turning the car (due to a fore and aft raking of the steering pivots) is the primary cause of wobbling, is an interesting one and worthy of close study. That the use of vertical pivots will always cure the trouble is doubted, however, as wobbling has been noted in cases where the pivots were vertical.

There seems to be much more likelihood that the interaction of springs and steering leverages is the primary cause of the trouble, and that this is aggravated by loose connections. Clayden's statement that increased friction in the connections prevents wobble is in line with the view expressed in the second item in this discussion.

As to a comparison of effects on wheel wobble of rearwardly inclining the pivots vs. the spring action, Clayden states that, due to inclining pivots, one wheel may drop and the other rise perhaps $\frac{1}{4}$ in. in making a turn of minimum radius where the inner wheel is cut say 30 deg. from straight forward position. A 30-deg. swing does not occur in wobbling. Five deg. is about average on either side of neutral position, unless there is a great deal of looseness in the connections, and 15 deg. perhaps a maximum, giving a total swing of 30 deg. from extreme to extreme.

Assume that the knuckle pivot is located in a vertical plane, according to the usual American practice, and not inclined transversely toward the frame. The average rearward inclination of the steering knuckle pivot is less than 3 deg. = angle Δ . Taking the distance X in Clayden's Fig. 4a as 3 in. we have the rise or fall of each wheel = $3 \sin \beta \sin \Delta$ Fig. 7. Where $\beta = 15$ deg. we have a movement = $3 \times .25 \times .052 = 0.039$ in., which is only one-sixth of the $\frac{1}{4}$ in. mentioned by Clayden. This is hardly enough to account for the wobbling, as the corresponding force must be applied through a reduction of about 20 to 1, thus in moving up or down this 0.039 in. the point A has circled a distance of $(2\pi \times 3 \times 15) \div 360 = 0.7854$ in., and $.7854 \div .039 = 20.2$

The point A in moving about $\frac{3}{4}$ in. bends to compress the spring about .04 in. If the stiffness of the spring is 400 lb. per in. the measure of the compression due to the movement of A is about 16 lb. If this is reimpressed by the spring on the steering knuckle it cannot be more than

$$16 \times \frac{.039}{.785} = 0.79 \text{ lb.}$$

or less than 1 lb. at the point A. Even this will be considerably reduced because of the friction losses in the spring leaves, in the pivot bushings and thrust bearings.

While it may be true that even this feeble effort tends to impress a wobbling motion to the wheels, it would appear to be unlikely that it is the real cause of the trouble. On the other hand, even a small divergence in the arcs xx and yy develops forces which are applied by direct and powerful leverages, and can reach a considerable intensity under conditions of synchronous vibration. This has been confirmed, in the writer's experience, by the fact that wobbling has never occurred when only the right-hand wheel was encountering a series of road waves that would sometimes cause the wobbling if the left wheel passed over them. As the cars were left-hand steer, bumps under the right-hand wheel had but little effect on the left-hand steering arm which was connected to the drag link.

Placing the steering spindle in the middle plane of the wheel, as advocated by Clayden, will not obviate wobble if the steering layout is faulty, and such a design has some serious drawbacks.

To obviate wobble:

- (1) Steering mechanisms must be laid out so as to prevent appreciable angular movement of the knuckle steering arm when the spring flexes;
- (2) Steering pivots should be ample in size and the bushings spaced as widely as possible so as to minimize bearings loads;
- (3) Provision for continuous lubrication of pivot and tie rod bushings must be provided so as to prevent wear.

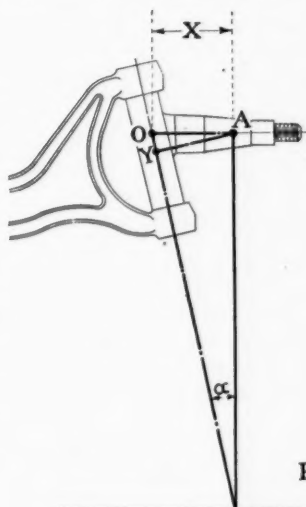


Fig. 6

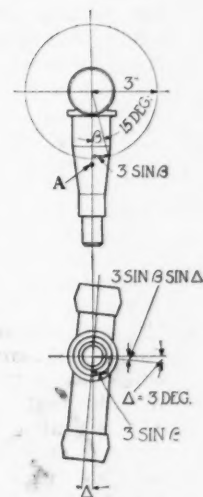


Fig. 7

Fig. 6—Diagram showing effect of transversely raked steering pivot. Fig. 7—Diagram illustrating small amount of spring motion occasioned by slight rearward rake of steering knuckle pivot

Motor Vehicle Interests Uniting to Support Sound Legislation

Concerted action to be taken for equitable regulation and taxation. Special taxes must not be of a punitive nature. Public and law makers need to be taught broader policies. Industry must take lead in solution of vital problems.

SUBSTANTIAL progress has been made since Jan. 1 in the unification of motor vehicle interests for the support of legislation along broad and equitable lines. In most States the policies followed will be those advocated by the Motor Vehicle Conference Committee after careful consideration of all the factors involved.

Legislation proposed in the various States whose legislatures now are in session can be divided roughly into three classes:

State regulation of motor vehicle common carriers.
State restrictions on motor vehicle operations.
Special taxation for motor vehicles.

Broad principles which are believed to be fair both for the public and for all phases of transportation have been laid down by the Conference Committee. Those in relation to regulation of motor vehicle common carriers, one of the latest as well as one of the most important elements in the legislative situation, follow:

1. Control over intrastate transportation of persons and property for hire, over regular routes or between fixed points, if adopted, should be exclusively in the hands of some agency of the State. No power whatever in the premises should be vested in the governing bodies of the municipalities of the State.
2. Such State control over motor vehicle common carriers should be placed in existing Commissions, such as the Public Utility Commissions, etc., of the various States. It should be provided, however, that at least one member of such a commission should be conversant with and in sympathy with motor transportation.
3. As a prerequisite to the operation of a motor vehicle common carrier, the owner thereof should be obliged:
 - a. To obtain a Certificate of Public Convenience and Necessity with a proviso that lines in actual operation before the law goes into effect shall, *prima facie*, be regarded as necessary to public convenience and necessity, and should, therefore, automatically be granted a certificate.
 - b. To take out liability insurance adequate to indemnify injuries to persons or damage to property resulting from negligent operation.
4. The State regulatory bodies having control over motor vehicle common carriers should be vested with the same powers they exercise in controlling other forms of public utilities.
5. Any special or extra fees levied upon motor vehicle common carriers should be utilized exclusively for highway maintenance. Such special or extra fees should in no case be more than 100 per cent greater than the normal registration fees for the vehicles of the class to which they belong.
6. Legislation should be enacted enabling steam railroads, trolleys and shipping companies to acquire,

own and operate the motor vehicle in conjunction with their regular line of business.

Fundamental principles outlined for consideration in relation to special taxation are:

1. The State should be the sole taxing agency—Federal, County and Municipal Governments to be excluded from the field.
2. The total amount of taxation should be limited to the sum of money necessary for:
 - a. Administration of State Motor Vehicle Department.
 - b. Maintenance of Improved Highways of the State.
3. The term "maintenance" and the items which it shall include should be sharply defined and strictly limited in application.
4. No money derived from special taxation of the motor vehicle should be spent for maintenance of highways unless such highways are located where the highway transportation needs of the State require and unless such highways are built of materials and in a manner to meet these needs.
5. The total amount of justified taxes should be raised in a manner which most equitably distributes the cost among the various classes of vehicles and the units within each class.
6. All money raised by such special taxes should be placed in the State Motor Vehicle Maintenance Fund and spent by the State or under State supervision on the improved highways in the order of their importance and in accordance with their maintenance needs.

Restrictions on the operation of motor vehicles relate chiefly to size, weight and speed. They vary so greatly in the different States that it is difficult to outline a definite policy in respect to them, but considerable progress has been made even along this line.

National Activities Outlined

Pamphlets setting forth the views of the Conference Committee have been placed in the hands of every law maker in the country. They also have been distributed among the State sub-committees of the Conference Committee and the 1200 organizations interested directly or indirectly in the motor vehicle. The reactions from these pamphlets indicate that the fundamental principles laid down are generally conceded to be sound.

Many of the State sub-committees are functioning efficiently, although it must be admitted that some of them are not. The biggest job of the Conference Committee is to teach them to help themselves. They always are told why these big questions must be considered from a national viewpoint.

Several States have taken the position that the sub-committees are not broad enough in their scope. Where this message has been received, the word has been given to swallow up the sub-committee for it is evident the conference idea is gathering strength. In some cases as many as 18 or 20 organizations have sent representatives to conferences and they have reported back to the membership of their organizations.

Emphasis is placed on the fact that these conferences should be held in advance of the legislative sessions for consideration of problems likely to come up and decisions on how to meet them. When state committees are made to realize that they must cooperate with chambers of commerce and highway associations an important forward step has been taken. Distinct progress has been made in this direction this year.

Automotive Managers Indifferent

One obstacle in the path of concerted action in many sections is the indifference shown by the managers of automotive factory branches. These men frequently are practical strangers in their communities. They may be wonderful salesmen, but they take little interest in civic problems for they know they may be transferred in a few months. It is felt these men should be leaders of thought in municipal affairs and especially along automotive lines. They often, however, prove real stumbling blocks in efforts to prove to the public the permanency and public spiritedness of dealer organizations.

There is a growing feeling among the men most deeply interested in the subject that means should be provided for a thorough and impartial investigation of each major problem far in advance of the legislative sessions. The industry should be a leader of thought in this respect. As conditions stand now it is difficult to formulate a definite policy until after the law makers have begun their deliberations. As an example, the three pamphlets setting forth the views of the Conference Committee on the fundamental principles of three vital subjects were not distributed until Jan. 1.

Recommendations resulting from these surveys should be predicated upon the most expert knowledge available. These investigators should study the purpose of laws proposed and the general economic effect they would have. This should be the first step.

The second step would be to send to every State in the Union men whose duty it would be to arrange meetings and tell the significance of the recommendations made by the motor vehicle interests. They should tell what attitude should be assumed in reference to legislation in that particular State, what machinery should be set up to meet the situation and various points of that nature.

Public Must Be Sold Idea

The third step would be for the State organizations, fortified with this complete information, to sell the public and the law makers on its ideas.

If the industry ever is to become a real leader in the solution of vital economic problems, it must undertake work of this character and it should be begun this year. It would cost money, but the results would more than justify the expenditure.

Law making in the future will be developed along economic rather than punitive lines and the successful lawyer will be a real economist. He must be able to apply cold logic and he must have all the facts in his possession.

Applying this principle to the automotive industry, such a man would be able to show the fallacy of the claims made by railroad and traction interests that they are carrying more than their share of the tax burden.

He would be able to trace the history of land grants and subsidies to railroads as well as the amount of water in their stocks. He would be able to present the same facts in reference to traction companies and then show that the automotive industry never has been given a highway subsidy.

It is the constantly increasing burden of taxation upon the motor vehicle operator which must be considered rather than the form of tax. It makes little difference whether the tax is based on gasoline consumption, horsepower or weight so long as the burden is not excessive. The fixed charges of taxation are rapidly becoming so large that they are setting up serious sales resistance. In other words, taxation must be levied on a scientific basis.

There have been apparent in the State legislatures this year no new frills in the way of taxes. Most of the bills presented thus far tell the same old story of a determination to levy against motor vehicle users all the traffic will bear.

Several States have pending measures relating to the regulation of motor vehicle common carriers. The foremost advocates in most cases are the steam and electric railroads. It must be admitted, however, that a more reasonable attitude is being displayed by the traction interests. They have real justification for the contention that vehicles of this character should pay a special tax. Their contention, however, is that the tax should be levied on the basis of a certain amount for each ton or passenger mile. The position of the industry, on the other hand, is that this special tax should not be more than 100 per cent in excess of the normal tax paid by the type of vehicle under consideration. The fees proposed by the trolley companies, in almost every case, would be many times in excess of those advocated by the Motor Vehicle Conference Committee.

Special Tax to Go to Maintenance

All interests are united on the principle that the special tax charged should be used for the maintenance of the highways and that it should not exceed the actual damage done to them by the vehicles paying the tax. The chief question is whether or not it is possible to determine scientifically the wear and tear caused by any specific vehicle.

While no serious effort will be made to combat the theory that there should be some form of regulation for motor vehicle common carriers as well as a special tax, the automotive industry will combat to the last all efforts to tax them off the highways.

The strongest proponents of extortionate taxation are those traction companies which cannot afford to provide themselves with motor bus equipment or which have been unable to obtain the necessary state or municipal sanction for entering a field not specifically covered by their charters.

A ONE AND ONE-HALF ton model truck designed for light delivery work and assembled from well-known units has been placed on the market by the G. A. Schacht Motor Truck Co.

This new model is powered with a four-cylinder, overhead-valve Wisconsin engine with cylinder dimensions of 4 in. by 5 in. Pressure lubrication feeds through a hollow crankshaft to the main bearings and connecting rod bearings. An oil lead is provided to the rocker arms.

Other units include a Fuller multiple-disk clutch and four-speed gearset and a double reduction rear axle. Drive is taken through ball-jointed radius rods. Tire sizes are 36 x 3½ for the front and 36 x 7 for the rear.



The FORUM



Transversely Inclined Knuckle Pivots Held to Make Steering Harder

Fergusson contends that front of car must be raised when king pin is tilted to give center point steering

Editor, AUTOMOTIVE INDUSTRIES:

The paper Herbert Chase has presented* and the discussion thereon should certainly result in clearing up many points about which there is apparently much misunderstanding at the present time.

There is no doubt in regard to the desirability of so-called center point steering and it is generally conceded that such types as the old "Marmon" and the suggested designs of Mr. W. J. P. Moore are too expensive and bulky, many such designs have been in production in the past and have been abandoned. Mr. A. L. Riker had a very similar design in his early electric

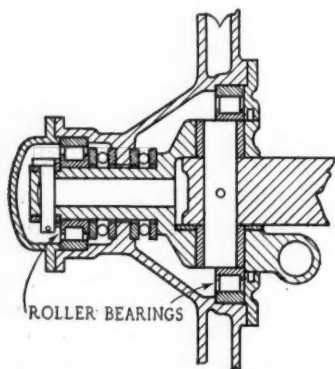


Fig. 1—Leyland truck knuckle and wheel spindle. Knuckle pin is in central plane of wheel

cars built over twenty-six years ago. The Leyland Co., England, used for several years a design almost identical with Mr. Moore's suggestion, on all their motor trucks up to about eight years ago when they gave it up for the more conventional design. It is very apparent from Fig. 1 what a large diameter inner roller or ball bearing is necessary. Mr. Moore's sketches are apparently diagrammatic, it being impossible to assemble the stub axles on the spherical ends of the I-beam axle as shown. The lengths of the bearings indicated in the ends of the I-beam axle are much too short for long life and freedom from wear. When these are made adequate to resist the load due to the front wheel striking a rut or a curb sideways, the size of the large ball bearing will be very excessive.

These designs are all shown with a horizontal stub axle, this looks very bad in practise, as whatever the reason, whether due to the roads being made with con-

siderable camber for drainage and it being desired to have the wheels run in a plane radial to this curved surface, or whether due to the early adoption of the artillery wheel with the rather pronounced dish that was to be given to the spokes so as to make the wheels stronger sideways, the lower spokes being kept vertical by sloping the stub axles, it has become universal practise to slope the front stub axles from $1\frac{1}{2}$ to 3 deg., and a car with horizontal stub axles looks as though the front axle had sagged and allowed the wheels to assume a knock-kneed position. This would actually be so, as the I-beam axle will deflect considerably, due to the load upon it and any play in the vertical pivot pins or the wheel bearings will give an additional slope to the wheels; so that it is desirable to give almost 1 deg. of slope to the stub axles to make the wheels run in a vertical position on a flat cross-sectioned road, and they should have at least 1 deg. additional slope to compen-

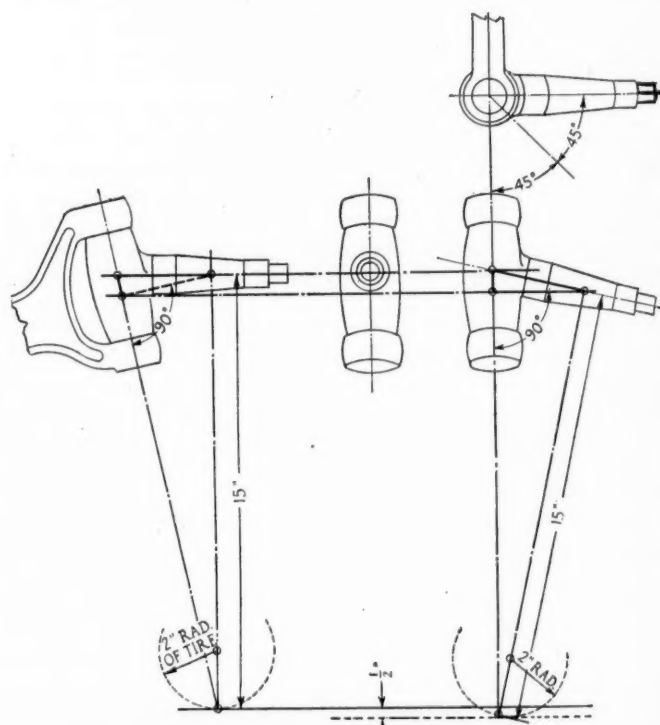


Fig. 2—Diagram showing how car fitted with transversely inclined knuckle pins must be raised when the wheels are cramped

*This communication was submitted as discussion of the paper entitled "A Critical Study of Modern Steering" presented at the recent annual meeting of the Society of Automotive Engineers. The paper was printed in AUTOMOTIVE INDUSTRIES for Dec. 21 and 28, 1922.

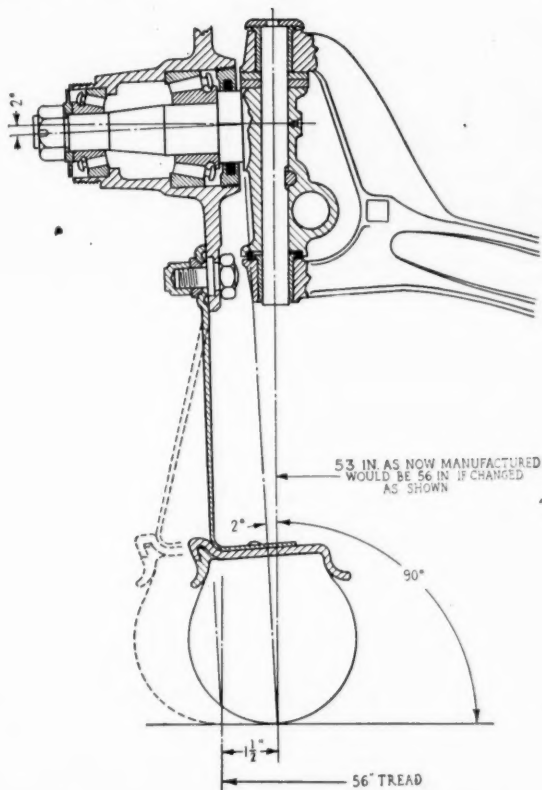


Fig. 3—Design does not permit of using wood or wire wheels without changing tread. Full lines show proposed means of securing central-pivot steering without using inclined knuckle pin

sate for the usual camber on roads. Some manufacturers make the rear axle with sloping wheels also, but this is very exceptional, because of the expense and complication involved, but the front stub axles can be made to slope just as easily as they can be made horizontal, when of conventional design, and a little extra slope gives a very rakish appearance to the car and has the distinct advantage of lessening the distance from the center of the tire to the pivot pins, besides giving considerable increase to the steering lock with standard tread at tire contact with the road.

The inclined knuckle pin as shown in Fig. 9,* Mr. Chase's paper, is a very simple and inexpensive means of accomplishing so-called center pivot steering, the only disadvantages being the alleged tendency for wheel wobble and the raising of the car when the front wheels are turned. See Fig. 2. By drawing these diagrams to scale it will be seen that when the front wheels are turned through an angle of 90 deg. the I-beam axle being assumed to remain at the same height from the ground, the wheels will sink into the ground $\frac{1}{2}$ in. Of course it is impossible in practise to turn the wheels through a greater angle than about 45 deg., in which case both front wheels would sink into the ground $\frac{1}{4}$ in., seeing that the ground is fixed, the whole front of the car, including axles and wheels, will be raised $\frac{1}{4}$ in. This must make steering more difficult than with vertical pivot pins and center-point steering, though it will have the advantage of a greater self-righting tendency. Were it not for the fact that manufacturers feel they have to conform to public taste in regard to wheels, some demanding wood, some wire and some disk, it would be very simple to obtain center-point steering with

vertical pivots by adopting single-plate disk wheels, though I believe a well-made wood wheel is the best type. On the other hand a steel disk wheel is preferable to a poorly made wood wheel. One prominent manufacturer has already pinned his faith to disk wheels by adopting a design that will not permit of using wood or wire wheels without changing the tread. Fig. 3 shows this design, the dotted disk wheel and tire, showing it as now being manufactured. The full-line disk wheel and tire shows a proposed means to give center-pivot steering with vertical pivot pins. Of course the hub flange should be moved further out to give increased disk to the disk wheel. There are two objections to this design. It necessitates a 3-in. longer I-beam axle retaining the 56-in. tread, giving increased weight and it increases the load on the inner bearing of the wheel. It might be argued that the ease of steering of the present excellent design, in which the projected center line of the pivot pin is only $1\frac{1}{2}$ in. away from the center of the tire at the ground, would not be bettered enough in the suggested design to warrant the above changes and it is quite possible this is so, unless front wheel brakes were to be used, in which case approximate center-point steering is very desirable. The single-plate disk wheel lends itself to accomplishing this without any great change to conventional designs of steering pivot axles and hubs.

DAVID FERGUSON.

Air Cooled Engine Design

Editor, AUTOMOTIVE INDUSTRIES:

The discussion of air cooled engines at the December meeting of the Metropolitan Section, Society of Automotive Engineers which was reported in the December 21 issue of AUTOMOTIVE INDUSTRIES again discloses the erroneous conceptions held by most of the engineers in the automobile industry regarding air cooled engine design and shows how the difficulties that were encountered some ten or more years ago have come to be regarded as being inherent in the air cooled engine.

J. G. Perrin's statement to the effect that the chassis must be designed with regard to the characteristics of the engine as done by Franklin may be true if air cooled engines were to continue to have the limitations and disadvantages as outlined by H. M. Crane, but the writer is of the opinion that in a properly designed air cooled engine the limitations and objections as brought out in the discussion need no longer apply.

The writer has recently completed some original experimental and research work on air cooled engines and has as a result perfected a very simple and highly efficient means for controlling the temperature of the cylinder head, eliminating the difficulties that have come to be regarded as being inherent in the air cooled engine, improved the performance, produced perfect cooling, eliminated all hot spots, produced a perfect dry gas and produced uniform combustion throughout the entire speed range with any make of carburetor, using ordinary commercial gasoline. And strange as it may seem everything is just as accessible as any water cooled engine. There are no ribs or fins on the head and the head is detachable. The actual tests were made on a six-cylinder air-cooled engine 3-11/16 bore by $4\frac{1}{2}$ stroke.

With the highly efficient means which the writer has developed for transferring the heat and controlling the temperature it has been proved by the tests made that most of the cooling ribs or fins can be dispensed with and their size, shape, spacing, relative location or the material the fins are made of is of small moment.

OLIVER E. BARTHEL.

*This reference is to the Rolls-Royce knuckle marked Fig. 9 in the paper as printed in AUTOMOTIVE INDUSTRIES and Fig. 10 in the S.A.E. preprint.

University Research Laboratories Provide Industrial Aid

Colleges can investigate problems of great future value to industry. Factory work is confined to immediate questions. Electrical and railroad executives have obtained considerable benefit from technical school studies. Trained men provided.

By Harry Tipper

MORE attention might well be given to the value of the technical university research laboratory to the automotive manufacturer. Research which can be conducted in the laboratory of a business institution is necessarily confined to work which can be strictly applied. Larger institutions are able to devote a certain amount of time to more fundamental research which may not find its application in practice for several years, but there is a very definite point beyond which it is not practical for the business institution to go in conducting research of a scientific character.

Technical society activity in research is the excellent and necessary work of coordinating research efforts and developing their applications to industrial problems.

The university is not confined so strictly to the solution of immediate questions. It can undertake a series of development researches which improve the knowledge and aid in the practical application, but which may not be of immediate importance in a commercial sense.

The work of the university, however, may get side-tracked into grounds of pure science unless it is coordinated with business to some extent. This theoretical work may not improve the practice of the art as much as satisfy the theories of the experimenters.

Some of the older industries have found a very effective way of coordinating the work of the university with the other research. The facilities of the university and the efforts of its students are directed along lines important to the industry but not sufficiently commercial at the moment to be undertaken by the research laboratories within the industrial institutions themselves.

This method of cooperation has enabled the industry also to seize upon another advantage offered by the research laboratory of the technical university. This laboratory is removed from any commercial considerations, from the necessities of routine which play so important a part in all laboratory work in business, and from the element of time expense that is involved in all industrial activity.

Experience of Older Industries

THE electrical industry and the railroad industry have gone further perhaps than any others in effecting this coordination and in encouraging the universities in the development of their research facilities. These industries have used university research facilities for the investigation of questions of importance to the industry not requiring an immediate answer and not involving an

immediate commercial consideration. The electrical industry, for instance, has cooperated with the technical universities in determining the conditions under which, at high tension, the distribution of electric current can be carried out, the effects of extreme voltage, and other scientific points. These items are of great importance to the electrical field in its present tendency and future probability of development, but are not yet within the range of practical application. The income derived from this work in some of the universities has been of great value in adding to their facilities and enlarging the opportunities which they offer to industry for the solution of problems incapable of being approached in the regular research laboratory of the business institution.

Independent Research Needed

THE scientific development of the automotive industry will require more and more of this independent farsighted research which is not hampered by the surroundings of the factory or the pressure of commercial affairs. There are many elements of difficulty in the progress of carburetion still to be solved. The practical manufacturer must remain within the field of known value in his practice in building the carburetor and the laboratories attached to the factories are limited to some extent by the same consideration. In the meantime, universities could be exploring further ahead in connection with the factors entering into pure economy, and developing experimental results of importance to all manufacturers of automotive units as well as to manufacturers of devices for carburetion.

The Government of the United States, in its army work, uses the facilities of some of the technical universities to test experimental developments in connection with automotive apparatus and in respect of the development of its machinery of war.

There are many elements involved in the practicability of various types of drive and traction where purely scientific examination, conducted outside the range of commercial necessity, is as important as the practical examination conducted in the research laboratories of the industry itself.

Most of the older industries have found ways and means of effectually cooperating with the institutions of learning, enabling these institutions to enlarge their facilities for research and, at the same time, apply the research work more strictly to the developments necessary for the future progress of the industry itself.

The automotive industry is one of the largest industries in the United States. Its wide use of all kinds of materials and processes and the complicated character of its service demands will make necessary, undoubtedly, the use of these facilities for research which are just as improved as the factory research laboratories, but which serve a different purpose.

S. A. E. Research Work

THE work of the Research Committee of the Society of Automotive Engineers would naturally suggest an examination of the facilities attached to the various technical universities and the possibilities of cooperation with them in the extension of this part of the work. I believe that this development is a part of the program of that committee. The manufacturer, however, seems to have realized very little the value which has been secured in other industries out of these possibilities and the extent to which they can be used to further industrial progress. In the electrical railroads and the textile industries, for instance, the interest in this research work in the educational institutions is not confined to the engineers or other specialists, but is spread through the more important heads in the larger industrial establishments connected with the field.

The actual work of the Society of Automotive Engineers and the progress of the research could be aided very materially if manufacturers realized the possibilities involved in the facilities already possessed by the technical universities. A program of action, similar to that conducted in other fields, will permit the enlargement of those facilities.

The large electrical manufacturers take a number of graduates from the technical universities each year into their establishments. They are able to do this more effectively because the cooperation between these institutions and the industry has aided the education of the students by increasing its strict application to and the coordination of their problems.

The automotive field is becoming more highly specialized in its demands. The regular mechanical engineering training will have to be supplemented by some special work in the problems peculiar to this field. An effective means of directing this special work along practical lines is through cooperation in research developments.

Facilities within the technical university do not grow so readily where related industries take no interest in their development. Students take those courses of training through which they can readily be placed in industry. Where there is a demand the facilities are enlarged. Cooperation between the educational institution and industry is of considerable importance because of the value to the industry of the work done and because of the provision of better trained men already informed to some extent concerning the work which they will have to take up.

Trained Men Provided

WE believe the subject is worthy of the manufacturer's attention, and of some active consideration in the near future, having in mind the problems of the business, its size, and the importance of trained men entering its ranks each year.

Effect of Doped Fuels on the Fuel System

FURTHER tests have been made by the Engineering Division, Air Service, McCook Field, on the effect of doped fuels on various materials used in the fuel system. A preliminary report on the same subject was made in Information Circular, Vol. IV, No. 308, and additional materials are covered in Vol. IV, No. 383.

Conclusions were first drawn on the effect of the various fuels without the addition of a small amount of water to the fuels.

It is found—

(a) That the following materials are very slightly, if at all, affected by doped fuels:

Armco iron.	Zinc.
Duralumin.	Tin.
Aluminum.	Red fiber.

(b) That the following materials are very badly affected by such fuels:

Lead-clad.	Cork.
Copper.	Vellum.
Brass.	Iron.

(c) That the following materials are only slightly affected by these fuels:

Leather.	Monel metal.
Textoil.	

In order to simulate more closely the conditions in the fuel system, a small amount of water was added to the fuels which changed the order of the foregoing conclusions as follows:

Red fiber...	} Very slightly, if at all, affected.
Tin.....	
Aluminum...	} Slightly affected.
Duralumin..	
Monel.....	
Textoil....	
Leather.....	

Cork.....	} Badly affected.
Copper.....	
Brass.....	
Iron.....	
Zinc.....	
Armco.....	
Vellum.....	
Lead-clad...	

The materials tested were submitted to the action of high test gasoline, 9 per cent anti-knock, and 91 per cent high test gasoline, 7 per cent monoethylaniline and 93 per cent high test gasoline, and 50 per cent benzol, and 50 per cent high test gasoline.

A GOOD credit man must have some conception of the legal rights of his employer, otherwise he cannot do justice to his position. His knowledge of law should enable him to settle the legal phases of small daily questions without recourse to consulting an attorney. There are times, however, when the best of credit men need legal assistance for minor details and may turn to books for it.

Stanley F. Brewster's "Legal Aspects of Credit," recently published by the Ronald Press, is written with the intention of giving the credit man a thorough grounding in the legal phase of his subject. Business men find a knowledge of law is very valuable and in some cases almost indispensable. They may find material of great assistance in Brewster's new book.

This volume covers a much larger field than the title would indicate at first glance. Mention of a few of the major topics may give an idea of the scope of the work. They are: legal nature of sales, safeguarding payment in the sale of goods, legal rights and remedies of mercantile creditors and insolvency proceedings.

AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

Reg. U. S. Pat. Off.

PUBLISHED WEEKLY

Copyright 1923 by The Class Journal Co.

Vol. XLVIII

Thursday, March 8, 1923

No. 10

THE CLASS JOURNAL COMPANY

Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
David Beecroft, Directing Editor

U. P. C. Building, 239 West 39th Street, New York City

BUSINESS DEPARTMENT

Harry Tipper, Manager

EDITORIAL

James Dalton, Editor
Norman G. Shidle, Managing Editor
P. M. Heldt, Engineering Editor
Herbert Chase, Engineering Editor

DETROIT OFFICE
J. Edward Schipper

WASHINGTON OFFICE
26 Jackson Place, N. W.

BRANCH OFFICES

Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
Detroit—317 Fort Street, West, Phone Main 1351
Cleveland—538-540 Guardian Bldg., Phone Main 6432
Philadelphia—1420-1422 Widener Bldg., Phone Locust 5189
Boston—185 Devonshire Street, Phone Congress 4336
Indianapolis—1212 Merchants Bank Bldg., Phone Circle 8426

Cable Address.....Autoland, New York
Long Distance Telephone.....PENnsylvania 0080, New York

United States and Mexico.....One Year, \$3.00
Extra postage west of the Mississippi River on account of Zone Postage Law.....0.50
Canada.....One Year, 5.00
Foreign Countries.....One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter.

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; A. C. Pearson, Treasurer; Fritz J. Frank, Secretary.

Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of Associated Business Papers, Inc.

Member of the Audit Bureau of Circulations.

Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly) July, 1907.

Working Together for Service

EFFORTS which are being made by a special committee of Motor Truck Industries, Inc., to improve service on specialized unit commercial vehicles and at the same time help dealers to dispose of used trucks they have on hand are distinctly constructive.

This organization is made up of manufacturers of both trucks and units. If its efforts are to succeed there must be a spirit of confidence, cooperation and accommodation. Thus far this important element has been gratifyingly conspicuous and because of it the organization promises to become a real power for good in the commercial vehicle field.

Cooperative efforts to aid truck dealers can bring tangible results, however, only if the dealers themselves are willing to lay aside jealousy and suspicion while they are working together for their mutual good. They are in even worse plight than their passenger car brethren because of the used vehicle problem. The struggle for existence may weld them together.

The manufacturers' association is proceeding from the sound premise that there will be continued demand for their products only if good service is given. They feel that, with the parts depots established by the unit makers and the help given by truck assemblers, there can be no excuse for anything but good service if dealers will do their part.

The industry will watch sympathetically their efforts to accomplish a herculean task.

Dollar a Gallon Gasoline Unlikely

THERE is no likelihood that "the people of this country must be prepared *before long* to pay at least \$1 a gallon for gasoline," the Senate committee investigating the petroleum industry to the contrary notwithstanding. Automotive interests have little need to worry about any such rise in gasoline prices in the near future even "if a few great oil companies are permitted to manipulate profits for the next few years" as the Senate committee says they have been doing since January, 1920.

Without discussing at all the merits of the dispute between the Senate committee and the oil companies, it is obvious that nothing could so quickly decrease the profits of the gasoline producers as raising the price to a dollar a gallon "before long." Exhaustion of the petroleum supply, coupled with an increasing demand for petroleum products, may conceivably quadruple the price of gasoline some time in the future, but no such price increase need be feared from combination or monopoly as such.

Large producing units, such as the Standard Oil Co., recognize better than anybody else that quantity production and large volume sales are requisite to large profits.

One sentence at least in a denial statement issued by W. C. Teagle, President of the Standard Oil Co. of New Jersey, will meet with acquiescence from everyone with any reasonable knowledge of modern industrial methods. Teagle is quoted as saying:

"The sub-committee's prediction of dollar gasoline is ridiculous. As to any unjustifiable increase in the price of gasoline, I will say that the availability of industrial alcohol, benzol and other substitute motor fuels at moderate prices fixes a limit beyond which the price of gasoline cannot rise."

The automotive industry need not worry specially about any tremendous increase in the price of gasoline because of industrial combination, although other serious evils may result.

Business Books Help Retail Sales

OLDSMOBILE has prepared a Five Foot Book Shelf for retail salesmen in its dealer organization. The list contains such well known business writers and merchandisers as Norval Hawkins, E. St. Elmo Lewis, Harry Tipper and Walter Dill Scott. There are 32 books in all. Salesmen are being encouraged to spend fifteen minutes a day in business reading from one or the other of these volumes.

The compilation of this list is a constructive step in dealer education. The factory is making use of carefully compiled and well presented selling information, written into book form by men who are experts in their special fields. It is probably helping the salesman more by encouraging him to read these authoritative views than by attempting to confine dealer education material to literature prepared by its own sales department.

The merit of a particular dealer education plan lies in its effectiveness rather than in its individuality. Few factories have had sufficient time to map out plans in great detail, nor to develop the organization methods necessary to operate them. Many manufacturers can use their house organs and other dealer contacts to promote wider use of general educational material already available. The Oldsmobile idea shows one excellent way to do this.

A New View of Motor Vehicle Taxes

A RATHER radical but possibly constructive proposal for the regulation of motor vehicle traffic has been made by Governor Smith of New York in a special message transmitted to the Legislature. His recommendation is that half the license fees received shall be turned over to local authorities for regulatory purposes. The other half would be used by the State for the maintenance of highways.

This plan, the Governor believes, "would enable the smaller cities and villages to have policemen at dangerous crossings and in the strictly rural communities would pay the expense of deputy sheriffs to prevent speeding on the country roads."

He adds that inasmuch as the Central Bureau of Records would be accessible to the Governor and the Legislature, "the fact that localities were not making proper provision for motor regulation would soon become apparent and the reverse would also be true."

This suggestion is predicated upon the recommendation that the licensing and regulation of motor vehicles shall be transferred to local authorities with central supervision through the department of State police.

While the Governor's plans are by no means perfect from the viewpoint of the motorist, for they may lead to an onerous multiplicity of regulations, he makes a strong point when he says:

"Up to this time the State has treated the automobile from the single standpoint of making it a source of revenue for the State and, instead of imposing a license for the purpose of regulation, automobiles have been looked upon only as an object for State taxation."

This observation certainly will strike a sympathetic chord. "And pity 'tis, 'tis true."

While the Smith proposal would take \$3,500,000 a year from the maintenance of highways, the money would be well spent if it were used sanely for the promotion of safety in traffic. Success of the plan, if it is approved by the Legislature, will depend entirely upon the spirit of the local authorities. Unless it is worked out honestly it can easily lead to petty graft,

"speed traps" and freak traffic rules which will make life miserable for the motorist.

The chief point for consideration by automotive interests is whether the good features of the plan outweigh the evil. On this there will be honest differences of opinion.

Human Problem Is Constant

WORKING conditions in the automotive industry have always been far above the average. All the important plants in which automotive production is carried on have been built within the last twenty years. Nearly all of them have been designed in accordance with modern ideas of industrial architecture. Those ideas involve good working conditions as a concomitant of efficient workmanship.

Rapid expansion and a ready market for automotive products has enabled the industry to pay relatively high wages to its workers. Quantity production has been more important than unit cost almost from the beginning.

A favorable background, relatively speaking, has been developed for cordial relationships between management and men. The possibilities for cooperation are good. Whether cooperation actually takes place throughout the industry depends largely upon the methods used in handling labor in automotive plants in the next few years.

The industry is moving into its period of stabilization. Tradition and habit are becoming a part of it more definitely than ever before. The power of these two factors will increase as stabilization proceeds. A tradition of fair dealing with labor under all economic conditions means future efficiency and profits. A tradition of frequently cut piece rates and promises made but not kept means future inefficiency and labor difficulties.

Employee representation or some normal means of communication between management and men is one of the best means of avoiding labor difficulties. The particular form which that communication takes is not important; the necessary thing is that there be some established method of procedure and a sincere desire on the part of executives to have it operate successfully.

Patience and thought are essential, of course, to any useful contact with employees. Executives have to take the trouble to be leaders rather than order-givers. To do this requires constant attention to human relationships, but usually saves major industrial strife.

The proper adjustment of the worker to his job and to his industrial surroundings is a problem for constant study and attention. Better progress toward solution can be made when labor difficulties are not acute; when the manufacturer gives attention to human relations by desire rather than necessity. Sporadic efforts at personnel work in boom times are not conducive to confidence on the part of workers. Constant attention to such matters builds up a constructive tradition of fair dealing that ordinary industrial storms cannot topple over.

Less Steel to Be Allowed Industry

Pittsburgh Producer Bases Curtailment on Tin Plate Needs

"No Hurry for Automobiles," It Declares—Companies Not Accepting New Business

NEW YORK, March 6—Announcement by an important Pittsburgh subsidiary of the United States Steel Corp. that it must reduce the tonnage of sheets available for the automotive industry because of the heavy demand for tin plate, brings memories of 1920.

On May 6, 1920, Automotive Industries announced that steel manufacturers had decided to divert steel from automobiles to the railroads because a large proportion of passenger cars were "non-essentials." The curtailment proposed was understood to have been set tentatively at 50 per cent.

Any intention of discriminating against the automotive industry was denied officially at the offices of the United States Steel Corp. with the statement that other industries also would be called upon to make sacrifices.

Almost simultaneously came the announcement that the Federal Reserve Bank of Kansas City had directed its member banks to discontinue the rediscounting of automobile paper.

In the present case the decision to curtail automobile tonnage is based on the excuse that there is an enormous demand for tin plates to meet the need for tin cans in the fruit and vegetable canning industry. It is contended that "there is no hurry for automobiles."

The Federal Reserve Banks of New York and Boston raised their rediscount rate three weeks ago, and there are persistent reports that another increase will be ordered in the near future because of the strong demand for money.

Steps Taken in Pittsburgh

PITTSBURGH, March 6—A leading manufacturer of steel for the automobile industry will shortly notify manufacturers that the tonnage of sheets available for the industry and specified in orders, must be reduced. This was learned here today from an official who stated that the tin plate business must be expanded and the curtailment will be made from the tonnages allotted to the automobile industry.

All specifications for sheet business, including industries other than the automobile field, are being turned down, as the company is sold up solid for the second quarter. Some of the business

Business in Brief

NEW YORK, Mar. 8—Commodity prices continue to rise, demand for goods is constantly expanding and the volume of industrial output is on a very high level. The first two months of the year have seen industrial activity exceed all expectations. Difficulty to supply demand for some commodities has been the cause of price strengthening and there has been a return in many cases to the paying of premiums. Efforts will now be expended to prevent a too-rapid increase.

The steel industry is operating at about 90 per cent capacity. Pig iron output is being increased and prices advanced. Prices of crude and finished steel and non-ferrous metals have risen. Similar advances on warehouse stocks seem probable, according to some authorities.

Placing orders for replenishment of stocks has permitted the reopening of plants wholly or partially idle and this resumption of activity has absorbed surplus labor until in many parts of the country there is a distinct shortage of skilled labor and practically no unemployment.

Reports from the grain belt indicate that the winter wheat crop is in a most favorable state as regards the future. Favorable reports come in from the South relative to the cotton crop. Last week cotton crossed the 30 cent level, a move which many predicted would occur. This advance in the price of raw cotton had its effect on textiles.

Car loadings for the week ending Feb. 17 showed a decrease of 35,511 cars, but it was a week with a holiday. Total loadings aggregated 817,778, a figure far in excess of the similar week of 1922.

is being satisfied with sheets of second quality.

There is an enormous demand for tin plate, it is said, for the fruit and vegetable crop, and the company must strain itself to supply such needs. There is no hurry for automobiles, it was said, so the automobile tonnages will be cut.

Automobile manufacturers, as quoted by a steel company, are unable to place

(Continued on page 597)

Month Moving Along on Higher Schedules

Increased Proportion of Plant Activities Are Devoted to Open Car Production

NEW YORK, March 5—With the big buying season yet to come, production in the major automobile producing plants is moving along on schedules that are 10 to 20 per cent higher than those followed in the first two months of the year. At this rate, March will turn out cars greatly in excess of the number a year ago, when, after an extended lull, factory operations began to take an upward swing that carried through a series of record breaking months and culminated in a year that established a high mark in the production history of the industry.

February schedules showed a tendency toward gradual expansion that resulted in establishing a new record for that month. Dealer orders are heavy and there is no indication of a disposition to stock cars against any but a conservatively estimated demand this spring. Dealers are basing their orders on conditions as they find them just as manufacturers are scheduling their output on the actual demand from dealers.

Driveaways Will Increase

A larger proportion of plant activities are now concerning themselves with open car production, increased popularity of this type accompanying the approach of the spring season. Such stocks of open car models as the dealers may have had on hand are moving rapidly and, due to the fact that open roads and seasonable weather will permit the greater use of driveaways as a means of delivery, there will be little trouble in replenishing these stocks except in cases where demand outstrips the rate of production. From now on this mode of delivery will become more general and ease this end of the transportation situation.

The lack of adequate rail facilities is not being felt so severely in the delivery of finished products as it is in the shipping of material from sources of supply. Manufacturers

(Continued on page 598)

Factory Output Exceeded by Demand

Equal Distribution Problem for Plants

**Dealers Recruited at Shows Must
Be Taken Care Of—March
Schedules Advance**

DETROIT, March 5—Automobile and truck production will show general increases in March over the two earlier months of the year.

The biggest problem of the month for factory sales executives will be in making equitable distribution of cars available for shipment and those that can be built. Orders are reported to be running far in excess of possible output, in the case of Ford alone there being dealer requisitions for 210,000 cars in March with only 150,000 that can be built at the utmost limit of production. Similar conditions prevail in all the big plants but on a proportionately lesser scale.

Factories are loath to discuss production for the reason that dealers and distributors are apt to feel that their wants are not being taken care of in the face of the apparently high output. "Just say we are operating at capacity," one factory executive countered. "We can't build all the cars the dealers want, and we are obliged to spread our output the best we can. It will probably be several months before output begins to approach sales levels."

Many New Dealers in Field

One reason for the heavy demand for cars that distinguishes the present season is that there are hundreds of new dealers in the field recruited at the shows, and factories are compelled to take care of them. This is especially true of the smaller companies, which have been without representatives in many principal cities, but which now declare themselves practically all closed up for the entire country.

Formation of local finance corporations in many sections of the country is reported by factory executives as having an important part in bringing new dealers into the field, this together with the vastly improved attitude of banks toward the industry generally and the more strongly established companies specifically. No difficulty is reported in getting credits for responsible lines. One factory that formerly had requests for financing through a central organization reports that in recent months there have been no requests of this kind.

Farm markets west of the Mississippi for the most part are in low-priced cars

Labor Shortage Is Seriously Interfering With Work in Steel and Iron Producing Districts

By S. W. UTLEY,

*Vice-president and General Manager of the Detroit Steel Casting Co. and
President of the Employers' Association of Detroit*

Detroit, March 6.

SHORTAGE of labor in the great steel and iron producing districts of the United States is making it impossible to bring production to within many points of the total required by orders, and as a result not only the automobile but all industries requiring steel and iron are unable to get material in quantities sought.

February reports by steel and iron executives representing plants from the Atlantic coast to St. Louis, show that operations are being held to 60 to 70 per cent capacity solely because of lack of men. There is no question of the ability of plants to meet orders if men were available. Facilities are entirely adequate but without men they are helpless. It is this condition which is holding shipments to the automotive industry. Rail facilities, though not the best, can meet the transportation requirements. All of the steel and iron plants are stocked with necessary raw materials for operations and have been since last fall. Getting men is the task which all industry is facing.

Detroit is employing new men at the rate of 2500 to 3000 weekly, a very large number of whom are coming from out of the city. The Employers' Association figures that every man in the city desiring to work is now employed. The employment curve today is higher than in the peak of periods of 1920 and is ascending. That is the condition in the city today and the outdoor building trades and public work is about to begin.

Automobile factories have not felt the labor pinch so much to date because of the better class of work they offer, but in foundries and other plants where the work lacks appeal there is a general shortage. Detroit too is probably better situated than most other cities because of its reputation for high wages and the fact that it is almost entirely an open shop city.

Bringing men into cities from farms, as was done in 1920, will have little or no effect on the general situation because, in the first place, there are fewer men on the farm today than in 1920 and, secondly, the appeal of outside work will take far more from the industrial plants than can be found to take their places.

With ascending wages necessary to get and hold men, coupled with the fact that production efficiency cannot be maintained with only part operation of a plant, there is certain to be higher costs and prices. The automotive industry has protected itself somewhat by pushing its production season several months ahead, but this will only partly meet the situation.

This situation is entirely the result of the immigration policy of the Government. Without immigration there can never be enough help. With Congress adjourned no action can be taken at a time it will be most needed and industry can do nothing more than make the best of conditions until the next Congress convenes.

If a period of depression does develop it will find American industry far less able to meet it than it was in 1920 with a number of years of sound prosperity behind it.

with only a scattering of business in medium-priced lines and little buying in the high-priced classes. There is better business in the Minnesota district than in territory in the Kansas City zone. Further south business is much better, especially in the Oklahoma City district and in Texas. Farm territories east of the Mississippi are buying much more heavily than on the western side.

The big buying movement generally is in the East, on the Pacific Coast and the industrial cities of the Middle West, with much improved buying in the South. Many cars are being driven away by

dealers in the East in spite of snow, and in the South cars are being driven to many points from railroad terminals to save time in transshipping over branch lines. No effort is being spared by the factories to get the cars started, and dealers are helping by driving away cars wherever possible.

Ford's 150,000 cars in March will show a large gain over February which will surpass the 100,000 mark for the eleventh straight month. Chevrolet will build about 1500 daily, and Buick, Dodge Brothers and Studebaker will continue

(Continued on page 595)

National Elects Earl as Head of Company

Will Assume Active Charge Immediately—Anthony Vice-President and Treasurer

NEW YORK, March 5—Clarence A. Earl, former president of Earl Motors, Inc., has been elected president and general manager of the National Motors Corp. This anticipated action, which has been in course of negotiation for some time, was effected at a meeting of the board of directors of National Motors in this city. Earl will assume active charge immediately. The general executive headquarters of National Motors will be in Detroit.

Another appointment of the highest importance also was announced. Walter M. Anthony, treasurer and comptroller of the Maxwell Motor Corp. for eight years and for ten years treasurer of the Commonwealth Edison Co., was made vice-president and treasurer of National Motors.

Operating Personnel Complete

The executive operating personnel of the corporation now is as follows: President and general manager, Clarence A. Earl; vice-president in charge of production, A. A. Gloetzner; vice-president in charge of the Kentucky division, Robert V. Board; vice-president in charge of the St. Louis division, T. C. Brandle; vice-president in charge of the Indianapolis division, George M. Dickson; vice-president in charge of the Saginaw division, C. V. Hale; vice-president in charge of the Jackson division, Walter J. Mery; vice-president and treasurer, Walter M. Anthony; chief engineer, C. L. Halladay.

Installation of the additional executive officers of the National Motors Corp. is part of the general manufacturing and operating program which the corporation has been working hard at developing during the past year. There is no change in the executive policy of the corporation, it is stated, but Earl and Anthony have been chosen to take active charge of their departments to urge the work of manufacturing at top speed.

55,000 Vehicles Scheduled

Assumption of office by Earl is an important step in the manufacturing program. The scheduled production of National cars and Traffic trucks, 55,000, puts National among the big producers. The full line of National automobiles in three classes has been exhibited in the motor shows throughout the country.

Headquarters of National Motors will continue temporarily in Chicago until the acquisition of one of the large plants in Detroit, which is going to join forces with the new organization, can be legally continued.

National Motors is the merger of nine

TENDENCY IN FRANCE TO INCREASE PRICES

PARIS, Feb. 25 (by mail)—There is a general tendency toward an increase in the retail price of all automobiles on the French market, the amount of the increase varying between 5 and 10 per cent. The explanation is the increased cost of raw material, caused by the low production of the blast furnaces.

The decreasing value of the franc on the exchange market is also tending toward a rise in car prices. Fiat has jumped the price of its 10 hp. model 1500 francs because of the lower value of the franc compared with the lira. There is an impression that the rise in prices is likely to continue during the year.

An increase in tire prices is expected almost daily, in view of the fact that rubber and cotton are rising while the value of the franc is dropping.

automobile companies in seven States. It was known at first as the Associated Motors Industries.

Pierce, Butler & Pierce Buys Federal Radiator Co.

SYRACUSE, March 6—Pierce, Butler & Pierce Manufacturing Corp. has purchased the Federal Radiator Co. of Zanesville, Ohio, the deal involving approximately \$500,000.

The Syracuse corporation purchases the finished products and raw materials of the company. The plant at Zanesville was built about three years ago and occupies a ten-acre plot. Zanesville citizens subscribed to financing the project to the extent of about \$1,000,000. The formal transfer of the plant to the new owners was accomplished without any interruption to production.

Irving N. Beeler, vice-president of the corporation, says that no new financing is involved in the expansion, the company having available funds to invest in the additional property.

Coast Company to Make Car for Sale in Japan

NEW YORK, March 6—Earl B. Spencer, formerly identified with the Pierce-Arrow Motor Car Co., has designed a small car for sale in Japan, which will be manufactured by the Fujioka Motor Car Co. of Los Angeles. The essential parts will be manufactured in this country and assembled at Tokio.

The company is financed by Sakai Shokai, Ltd., of Yokohama, which has stores in China, Japan and New York City. George B. Morrow, also previously associated with the Pierce-Arrow company, is purchasing agent for the Fujioka company.

Larger Jewett Plant to Produce 500 Daily

Work to Start in Summer—Net Profits of Paige-Jewett Placed at \$2,103,230

DETROIT, March 6—Paige-Jewett sales in 1922 totaled \$32,749,666, and net profits, \$2,103,230, covering shipments of 9,323 Paige and 20,420 Jewett cars, 26 per cent of which were closed jobs. This was reported by President H. M. Jewett at the annual stockholders meeting this morning.

Announcement was made of plans to extend Jewett production to 500 daily by the erection of additions to the present plants. Earnings on \$2,000,000 common stock par value \$10 was \$10.51. Cash dividends of 12 per cent were paid during the year, and a 100 per cent stock dividend in December, makes common stock capitalization in 1923 \$4,000,000.

Work on the new Jewett plant will start early in the summer. When completed, Paige production will be concentrated at the main plant. Sales prospects for the Jewett line were declared unlimited by President Jewett, who stated that competition in the \$1,000 price class was largely for four-cylinder cars and that the buying preference was for sixes.

Officers were re-elected as follows: H. M. Jewett, president; F. L. Jewett, first vice-president and assistant secretary; C. W. B. Cady, secretary; G. W. Lee, treasurer, and S. L. Depew, comptroller. These with E. B. Stair, J. H. Remick and C. B. Warren comprise the board of directors.

Officers reappointed were W. A. Wheeler, vice-president in charge of manufacturing; Henry Krohn, vice-president in charge of sales; Thomas Bradley, vice-president in charge of purchases; Andrew Buechlea, vice-president in charge of engineering; B. C. Young, assistant treasurer, and C. E. Knapp, auditor.

FALOR PLANT TO REOPEN

AKRON, March 6—The plant of the Falor Manufacturing Co., which went into receivership two weeks ago, will be reopened soon, according to W. T. Akers, receiver. Shelby Falor, president of the company, is expected to retire, and Chicago capital will be used to reestablish the company's tube manufacturing business. Akers reports net quick assets of the company to be \$34,000 and current liabilities to be \$58,000.

FRANKLIN BREAKS RECORD

SYRACUSE, March 5—H. H. Franklin, president of the Franklin Automobile Co., reports that February smashed all previous shipping records for that month, dating back over twenty years, and that the company has on its books more unfilled retail orders than ever before in its history at one time.

\$3,038,926 Reported Earned by Yellow Cab

Is Equivalent to \$14.95 on
200,000 Shares of Class B
Stock Outstanding

CHICAGO, March 5—Total net earnings in 1922 of \$3,038,926 as against \$607,654 in 1921 are shown in the annual report of the Yellow Cab Manufacturing Co. On the 200,000 Class B shares outstanding this is equivalent to \$14.95 a share. The present capital surplus is \$2,345,800, and there is an earned surplus of \$2,184,498.

The balance sheet as of Dec. 31, 1921, shows accounts receivable of \$1,400,320 compared with \$714,660 in 1921, and notes receivable of \$6,050,138 as against \$1,347,976. Among the liabilities, accounts payable are placed at \$1,188,933 as contrasted to \$338,343 in the previous year and notes payable of \$1,700,000 as against an unstated amount in 1921.

After telling of an addition to its plant which will be ready this month and which will increase production 100 per cent, President Hertz states in his report that the company is about to start manufacturing buses, and that by June or July it will be in production of two or three a day. Continuing, Hertz says:

Since Jan. 1 the company has enlarged its field of operations by incorporating the Yellow Coach Manufacturing Co. for the manufacture of motor buses; by incorporating the Yellow Sleeve Valve Engine Works, Inc., of East Moline, Ill., which company has purchased the engine business of the R & V Motor Co., leasing half of its factory and taking over that part of its organization pertaining to the manufacture of Knight engines for bus construction, and by incorporating the New England Yellow Cab Sales Agency of Boston for the sale of Yellow taxicabs in Boston and surrounding territory, similar to the operation of the New York Yellow Cab Co. sales agency which during the last year has made a remarkable showing in the sale of our products.

Along these lines it is contemplated opening branch sales agencies in Los Angeles, San Francisco, Newark and Paris, France.

Supreme Motors Creditors Asked to Approve New Plan

WARREN, OHIO, March 5—Creditors of the Supreme Motors Corp. of this city are asked to approve a reorganization plan which has been worked out by the trustee in bankruptcy, Hugh Wells, the creditors' committee, F. B. Whitlock, George F. Kast and S. C. Reynolds and the bond-holders' committee, Dan A. Geiger, F. W. Stillwagon and F. B. Whitlock.

It is proposed to organize a new corporation which will purchase for cash or other consideration all claims prior to the first mortgage, making such adjustments of the claims secured by chattel mortgages by return of the property or otherwise as may be possible, and to buy

BELGIUM BUYING UP USED AMERICAN CARS

PARIS, Feb. 24 (by mail)—One of the results of the high value of the dollar in European currencies is an increasing activity in the sales of used American cars on the Belgian market.

Belgian dealers are scouring France for Army Cadillacs, which they are purchasing at 10,000 to 12,000 francs and then shipping to Belgium. These cars are difficult to sell in France, owing to the high horsepower tax and heavy fuel costs, but they find a ready market in Belgium, where maintenance costs are not so high.

This class of business is compensating, in a considerable measure, for the falling off in sales of new cars by reason of the rising dollar.

the plant at court sale under foreclosure proceedings or otherwise.

In the new company, which would operate the plant, creditors would be given shares of capital stock equal to 20 per cent of the full amount of their claims without interest, while the bondholders would receive stock in the company for the full amount of the principal and interest on their bonds, interest upon the new bonds to be calculated at the coupon rate to the date when the corporation shall, by proper corporate action, authorize the issue of its capital stock.

As indicated in the reorganization plan, the total indebtedness of the company is about \$1,067,000, of which \$615,500 represents secured claims prior to the general creditors.

Government Files Claim Against Willys-Overland

TOLEDO, March 5—The Federal government has filed a tax claim against the Willys-Overland Co. here and the Wilson Foundry & Machine Co., at Pontiac, for \$7,000,000 covering the years of war activities of the two plants.

The claim was filed jointly because the two plants worked so closely together during the war and inasmuch as they filed a joint tax return. C. B. Wilson, who is head of the Wilson Foundry & Machine Co., also was vice-president and general manager of the Willys-Overland Co. for more than two years. Production of the Wilson plant is taken almost exclusively by Willys-Overland.

The taxes claimed by the government have to do with war contracts executed by the automobile plants and are the outgrowth of a number of audits taken on the books of the company by government experts.

While the claims are large, officials here believe that they can be settled satisfactorily, the matter being largely due to interpretation of the tax laws.

Profit of \$1,705,788 Netted by Chandler

This Is Equal to \$6.09 a Share as
Compared with 14 Cents
Earned in 1921

CLEVELAND, March 5—For the year ended Dec. 31, 1922, the Chandler Motor Car Co. reports net profits of \$1,705,788, after taxes, depreciation and inventory adjustments, which is equivalent to \$6.09 a share, earned on 280,000 shares of common stock of no par value in comparison with net profits of \$41,017, or 14 cents a share in 1921.

The income account shows a total income of \$3,995,778 in comparison with \$1,948,530 in 1921; expense, depreciation, etc., \$1,470,904, as against \$1,128,079; inventory, adjustments, etc., \$576,907, compared with \$779,434; Federal taxes, \$242,179; net profits, \$1,705,788, as against \$41,017; dividends, \$1,680,000, contrasted to \$1,960,000, and surplus, \$25,788, as against a deficit of \$1,918,983 in 1921.

It is stated that during February, 1923, the combined production of Chandler and its kindred company, the Cleveland Automobile Co., was in the lead in motor production in this city. It is understood that the two companies during that month shipped 200 cars daily and that in March that figure will probably be exceeded. This means combined shipments of nearly 5000 cars for the two plants for the month and represents sales of approximately \$5,000,000.

Conservative Program Followed

In making public the report for 1922, President Chandler stated that the company carried through a conservative program that was planned at the beginning of the year.

"It was then our best judgment," he said, "that in emerging from the deflation period, the automobile industry would do well to follow a program of conservatism. While maintaining this policy, Chandler manufactured and delivered about 100 per cent more cars than in 1921. The company has more orders on its books and is producing more cars than at any time since 1920.

British International Co. Plans Automotive Section

NEW YORK, Mar. 3—An automotive department will be opened by the British International Co., of 42 Broad Street, according to an announcement today. The company is engaged in the general export and import business, with branch offices and connections in numerous foreign centers.

George W. Poggenburg, formerly of the truck department of General Motors Export Corp., will head the department as vice-president of the company. Cars, trucks, accessories and other non-competing equipment will be handled.

La Follette Committee Sees Dollar Gasoline

Teagle of Standard Oil Scouts Idea—Price Fixing Is Charged by Senators

WASHINGTON, March 5—Congress was informed today by Senator La Follette, in reporting the findings of the Senate Committee investigating the cost of gasoline and other petroleum products; that continued domination by the Standard Oil group would advance gasoline prices beyond the reach of the public generally as a motor fuel. It was stated that the Standard companies fixed the retail prices of gasoline throughout the country.

Effect of Price Manipulation

It is predicted, in the report, that automobile owners and other gasoline users would be obliged to pay at least \$1 a gallon for gasoline "if a few great oil companies are permitted to manipulate prices for the next few years, as they have been doing since January, 1920."

With reference to the question of the price of gasoline and kerosene, the committee states in part as follows:

The controlling factor in fixing the retail price of gasoline and other petroleum products is the dominance by the Standard Oil companies of the retail market for those products throughout the United States, and particularly of gasoline and kerosene. Just as the Standard companies fix the price which the producer must accept at the well for his crude oil, so do they fix the price which the consuming public has to pay at retail for gasoline, and to a large extent for kerosene.

The great Standard Oil marketing companies, by confining their operations to a single fixed territory, are able easily to control the retail price of gasoline and kerosene in their respective territories. While it may be that a Standard company in a particular territory does only about half the business in that territory—and some of the Standards do more than half and some less—yet in all territory some Standard company is so much larger than any single competitor that it has come to be almost universally accepted that the tank-wagon price in any territory is controlled absolutely by the Standard marketing company for that territory.

Public at "Mercy of Combination"

According to the committee "it is essential to the life of the industry and vital to the public also that neither the public nor the small independent producers and refiners shall be left at present to the mercy of a combination which advances or depresses prices as it pleases."

Among the remedies suggested by the committee are the following:

A uniform system of bookkeeping in all oil companies doing an interstate business, which will show at any time in detail the costs and profits of the business so that the reason-

ableness of the prices charged for any petroleum product can be ascertained on a cost basis.

A compulsory system of reports to a Government bureau every month showing the operations of each oil company engaged in interstate commerce, and particularly the quantities of crude oil and its products in storage or transportation.

Pipe lines must be made real common carriers. Delivery stations must be established wherever a reasonable demand for them can be shown to exist so that pipe lines shall no longer serve simply the great companies, but shall serve on an equal basis every transporter of petroleum at reasonable rates, and in an efficient manner.

Such change should be made in freight rates upon petroleum products as will permit mid-continent refineries to once more find a market for their products through Michigan, Indiana, Ohio, Pennsylvania, and the New England States.

The exportation of petroleum and its products should either be prohibited, or so regulated as not to permit the export from this country of those products for which there is pressing demand in this country.

Any attempt at price manipulation, such as occurred during the past three years, should be made the basis of grand-jury investigation in every State where such prices were made, and, if the facts warrant, prosecution should be instituted, convictions secured, and jail sentences imposed.

The Department of Justice should immediately institute a rigid investigation into all claims for basic patents on pressure still processes used in the production of gasoline. There is no doubt that as a result of these patents, now largely controlled by Standard Oil companies, the production of gasoline is greatly limited.

The report contains several statistical exhibits regarding prices and production in various fields.

Refineries Discussed

In its discussion of refineries, the report says:

With the pipe-line connections which refineries have with the producing fields, through which their supply of crude oil is received, it is obvious that the Standard Oil refineries as a group have a tremendous advantage over the independents when both location and pipe-line control are considered.

Added to this is the fact that the so-called patented cracking processes are largely under the control of the Standard companies. By these processes the average production of gasoline can be nearly doubled if the operator so desires.

These facts show how impossible it is for the independent refinery to compete on equal terms with members of the Standard group. The refineries belonging to the two or three large so-called independent companies, such as the Sinclair, Texas, and Gulf, have been able to overcome this handicap to a large extent by their own pipe-line facilities and by obtaining control of some one of the several cracking processes.

These companies in their relationships, organization, and operation are more comparable to the Standard group than to the smaller independent companies.

Prediction Misleading, Says Teagle

NEW YORK, March 5—W. C. Teagle, president of the Standard Oil Co. of New Jersey, scouts the idea of \$1 a gallon gasoline, as predicted in Senator LaFollette's report to Congress on the oil investigation. Teagle, in an inter-

(Continued on page 599)

Hupp Had Best Year in History in 1922

Surplus Is Reported to Be Larger Than All Its Preferred and Common Stock

DETROIT, March 6—Total assets of the Hupp Motor Car Corp., as of Dec. 31, 1922, were \$19,079,581 and its surplus \$8,091,136, according to the annual report to stockholders made by President C. D. Hastings.

Both from sales and profit viewpoint 1922 was the most successful year in the history of the corporation and its subsidiaries. The company's surplus is declared larger than all of its preferred and common stock and that of its subsidiaries outstanding, which consists of \$5,192,100 Hupp common, \$677,800 Hupp preferred and \$67,086 preferred common and surplus of the Detroit Auto Specialties Corp., a subsidiary. Hupp owns 86.5 per cent of stock in this company and the entire stock of the American Gear & Manufacturing Co., Jackson, and the R & M Body Corp., Racine, Wis. The entire production of these is devoted to Hupp requirements.

Sales of 34,167 cars during the year represented an increase of 78 per cent over 1920, the company's biggest previous year. Hastings says that with increased space and equipment at the main plant, manufacturing processes are now more under control than ever before. Sales in the first two months of 1923 were more than double those of January and February of last year, Hastings states.

Clark Equipment Provides More Room for Its Axles

BUCHANAN, MICH., Mar. 5—The recent move of the Clark Equipment Co. in taking over the Days Avenue plant in this city from one of its other departments which it has moved to Battle Creek, was made to provide enlarged manufacturing facilities for Clark axles. These changes give the company from 25 to 50 per cent more capacity here and makes it possible, if occasion arises, to utilize additional available space at its other plants in Berrien Springs and Battle Creek.

In reporting on conditions, vice-president E. B. Ross says:

Our axle schedules are running very heavy. This is especially true in our light and medium weight models, which we build in both internal gear and bevel gear drive and in six models. There also is a decided picking up in the heavier models, the demand for which is increasing as general business improves. We think it will be much greater when the road building season opens this spring.

The truck industry is not as sensitive as the passenger car field. It has been slower in its return to normal conditions, but it seems now to be gathering momentum for a long swing forward.

Mexico Seen as Field for 10,000 Ford Cars

Company's Houston Branch Manager Makes Investigation of Conditions There

DETROIT, March 2—Ford Motor Co. business in Mexico in 1923 is expected to reach 10,000 cars, this total being based upon an investigation in the Mexican field by R. S. Abbott, manager at the Houston branch, which supplies almost all cars shipped into Mexico. In 1921 Ford sales in Mexico approximated 4100 cars, but there is an important improvement in the business outlook for the present year.

In explanation of the upward trend in Mexican affairs, Abbott says that the business men in Mexico are copying American methods in going after business rather than waiting for it to come to them. Practically every state, he declares, has launched a road-building campaign, and many roads connecting principal points will be opened in 1923. These improvements, he notes, are badly needed.

New Railroad to Be Opened

The railroad connecting Durango and Mazatlan, the greatest Mexican port on the Pacific Coast, will be opened within the next six months, Abbott states. Eighteen railroads connect Durango with all parts of the Republic, and this stretch of railroad when completed will connect all of Mexico with the Pacific Ocean. A direct railway line from Tampico to Mexico City is also under construction, which will be the direct means of creating business. Present traveling time of twenty-four hours will be reduced to six.

Reduction of freight rates on automobiles from the border to interior points will stimulate automobile business, Abbott says, in that it will permit dealers to sell at lower prices. Practically every business is opening up, and the country is rapidly recovering from its recent banking disturbances. With the government in control, the banking situation will soon be in sound condition, it is asserted.

Mines generally throughout the country are not operating, but a great many are opening up in the Durango and Parral sections, Abbott states, some operated by Mexican and some by American interests. Sales of sisal and henequin are picking up in the Yucatan section, and a revival in business in this particular territory is expected after the first few months of the year.

Oil Fields More Active

Work in the Tampico oil fields has shown greater activity in the past few months, especially since the government has allowed interests from the United States to resume operations. Almost all of the oil field workers have been re-employed.

Agricultural districts have been hard hit in sections by droughts. In Torreon, particularly, not a drop of rain has fallen in three years, and the rivers are dry. This district, Abbott says, should produce 300,000 to 400,000 bales of cotton yearly, and in 1922 only 13,000 bales were made. Coahuila and Durango, usually large producers of cotton, have had small crops due to lack of rain. Otherwise the country is reported advancing as an agricultural nation.

The agrarian law permitting the government to confiscate land and divide it among the people is withholding the development of the large haciendas, Abbott declares, owners not caring to risk conditioning of their properties with the possibility that it might be seized and divided among the peons.

In some of the smaller towns horse-drawn street cars have been replaced by cars drawn by a car propelled by a Ford engine. In Puebla twenty-five of these engines are in use and in Cordova there are about fifteen.

Receivership Not to Halt Sharon Steel Operations

CLEVELAND, March 5—The Sharon Pressed Steel Co. was forced into a voluntary receivership because of the Cleveland Discount Co. receivership, the Sharon company having been financed by the Discount company. Following this action, the court authorized the operation of the plant by W. L. David and Donald Thompson, receivers, who in turn appointed A. E. Swan, former vice-president and general manager of the Sharon company, as their agent and attorney.

The Sharon company has issued a statement in which it says: "The Sharon company has been struggling under limited finances for some time past, due to heavy fixed charges being carried over from previous reorganizations. The plant has approximately three-quarters of a million dollars' worth of business on the books, which is considerably more than at any previous time in its career. With the court's authority to continue operations, its prospects are considerably brighter."

Current Assets of Earl Exceed Debts \$1,293,588

JACKSON, MICH., March 5—In a statement announcing the refinancing plan under which the Earl Motors Manufacturing Co., a new corporation with a paid up capital of \$1,000,000, will lease and operate the plant of Earl Motors, Inc., President George C. Scobie states that the assets of the company show inventories of raw and worked materials, finished and partly finished cars, etc., of \$1,323,878; notes and accounts receivable of \$104,974, and cash of \$123,589; while the liabilities show trade creditors, accrued payroll, taxes, interest, etc., of \$173,567, and deferred liabilities—dealers' deposits, etc.—of \$85,286.

The excess of current assets over current liabilities amounts to \$1,293,588.

Underwriters Lower Cost of Insurance

Action Reflects Better Accident Record for Trucks Than for Automobiles

NEW YORK, March 5—Reductions in the rates of public liability, property damage and collision insurance are announced by the National Bureau of Casualty and Surety Underwriters, the rate-making body of twenty-five of the leading stock insurance companies of the country. These reductions apply to owners of trucks and other commercial vehicles and, in part, to owners of passenger cars in the suburbs of many of the larger cities. It is estimated that the saving to truck owners alone will amount to \$2,000,000 yearly.

These new rates, the bureau announces, were made because there had been a decrease in the loss cost per car during the last year as compared with the previous year. The reduction in losses is attributed to two things: post-war deflation and the numerous successful public safety campaigns which have been conducted during the last year.

No Improvement in New York

The new manual of rates shows reductions amounting to 10 to 15 per cent in commercial vehicle rates in almost every territory in the United States, with the exception of New York City. The failure to decrease rates in New York City is due to the fact that the accident experience of trucks there has shown no improvement.

Operators of coal hauling and furniture hauling trucks will share in an additional saving through the reduction of those two groups to lower cost classifications.

Although the reduction in rates for commercial vehicles was almost universal, public liability and property damage rates for passenger cars remain unchanged, except for some very minor territorial revisions, because, it is claimed, the records show that owners of passenger cars have made practically no improvement in their accident experience. Passenger car owners, however, will share with the truck owner a reduction of approximately 25 per cent in the rates for collision insurance, which is applicable in practically all territories.

25 Per Cent Cut in Collision Rate

Concerning the reduction in collision rates, the bureau says: "This reduction is the logical result of the improvement in the cost of repairs and the cost of parts. The stock companies, therefore, are able to reduce collision premiums as much as 25 per cent and even more in many of the larger cities."

The most important change affecting public liability and property damage rates is the restriction of city territories to smaller areas for rate-making purposes, particularly for trucks.

British Association Seeks Truck Tariff

**Manufacturers Would Have
33 1/3 Per Cent Duty Placed
on Imports from America**

LONDON, Feb. 24 (*by mail*)—It is announced by J. Maughfling, president of the Association of British Motor Manufacturers that the association has made application to the Board of Trade for a protective duty against all imported truck chassis.

Two distinct applications are actually in being, the first for a 33 1/3 per cent tariff under the Safeguarding of Industries Act and the second for an additional protective duty against all foreign truck imports. This means that the industry is seeking under the Act mentioned to have imposed a 33 1/3 per cent import duty on trucks made in countries where the exchange rate is appreciably below normal, and a further 33 1/3 per cent on all imported trucks under special Act of Parliament.

Industry in Serious State

As reason for these proposals Maughfling refers to the serious condition of the British truck industry; production has fallen to less than a quarter of what it was three years ago, and this sort of thing cannot continue much longer without the industry coming to an end. He says that seven of the leading firms of truck makers in England representing an aggregate capital of approximately 6½ millions sterling suffered total losses amounting to a third of that capital.

This state of affairs is ascribed to three factors: (1) The sale of surplus war stocks by the British Government; (2) the low exchange rate in France, Italy and Germany permitting trucks made in those countries to be offered in England at less than bare production costs to home makers of similar vehicles, and (3) the low prices of American trucks made possible by the comparatively huge outputs of plants in the United States. Attention is drawn, it need hardly be said, to the tariff wall protecting American trucks in the United States, and the fact that imported trucks of all nations are now allowed to enter England duty free.

Cite Automobile Protection

As a precedent for the general protective tariff which is sought, as distinct to that under the Safeguarding of Industries Act, the case of private passenger cars is quoted, and it is maintained that the truck makers are actually more in need of protection than those producing passenger cars.

It is not suggested that a 33 1/3 per cent duty on American trucks would put British productions in a position to compete on level terms with the former; in fact, it is admitted that it is not a big enough percentage to exercise a serious effect on the present rate of Ameri-

can sales, but it is believed that it would enable British makers to secure a fair share of the increased demand for trucks which is anticipated in the near future, now that the war surplus stocks are becoming depleted.

The question of unemployment in the truck industry is emphasized, and in the course of references to this phase of the question Maughfling says: "In 1920, 13,514 men in Great Britain were employed in making motor transport vehicles; in 1922 the number had fallen to 5394, and even that figure may be regarded as an overestimate on the ascertained basis that the production of a single 4-ton vehicle occupies 2.38 men for one year."

As to whether the applications of the truck industry will be complied with there is considerable doubt. The first, that under the Safeguarding of Industries Act will go before a standing committee and in due course evidence for and against will be heard; if the committee decides in favor of the request it remains to the Board of Trade to make an Order to that effect.

The question of a general protective tariff, which alone would affect American trucks unless "dumping" can be proved, would need the passing of a special Act through both Houses of Parliament, and opposition to such a measure as a matter of principle would be severe from the Free Trade elements.

Body Company Formed by Phillips and Staring

CLEVELAND, March 6—The Phillips Custom Body Co. has been organized and will operate an automobile body building plant at Ravenna, Ohio. Frank W. Phillips is president, and W. H. Staring is vice-president.

The company has a 12½ acre site with 30,000 sq. ft. of factory space on the Erie railroad within the city limits of Ravenna, which is sixty miles southwest of Cleveland. A production of 1500 to 2000 high grade bodies a year is planned. The capital of the company is 15,000 shares of no par stock, of which 10,000 shares are being placed at \$27.50.

Phillips was formerly president of the Phillips Carriage Co., and for the last nine years has been president of the J. B. Judkins Co., Merrimac, Mass. He has sold his interest in that company and retired from the presidency. Staring served as factory manager for the Peerless Motor Car Co. until R. H. Collins purchased control.

INDIANAPOLIS RACE SAFE

INDIANAPOLIS, March 6—All danger of the 500-mile international race being abandoned because of adverse legislation is past, the Governor having vetoed the bill which sought to prevent the running of the event on Memorial Day. The Governor held it was class legislation, and the Senate upheld the veto in the closing hours of the Legislature.

British Maker Gives Warranty for Repairs

**One Item Provides Owner with
Hired Car While His Is
Being Given Attention**

LONDON, Feb. 25 (*by mail*)—The Hillman Motor Co., Coventry, maker of a popular light car for two or four passengers, has decided after twelve months' experience to continue to give buyers a form of warranty which is entirely unlike anything of the kind offered by other British makers.

The usual form of warranty issued by British manufacturers merely undertakes to replace parts which are found to be defective after they have been returned to the plant for inspection; there is no understanding that they will fit the new parts in place. Defects in items made by outside firms are held uncovered. The usual form is one drawn up by the Society of Motor Manufacturers for use by their members and is generally adopted word for word.

Offer Made by Company

Hillman, on the other hand, offers as follows:

(1) To carry out or pay for all repairs, including material and labor costs, due to mechanical breakdown, except the first £1 of any claim.

(2) To pay a contribution toward the cost of hiring another car for use while the owner's car is being repaired, the maximum payment under this heading being £1 per day with a total of £30 in respect of each breakdown.

(3) To allow the owner to instruct a competent repairer to proceed with the necessary work at once providing the estimated cost is not over £5, exclusive of the cost of the new parts; if the estimate is over £5 for labor charges, the owner must await the consent of the company before putting the work in hand at their expense.

(4) To supply free replacements to be fitted by the owner or at his expense if he should prefer.

Bridgeport Truck Effects Purchase of New Factory

BRIDGEPORT, CONN., March 2—Through a transfer consummated yesterday, the Bridgeport Motor Truck Corp. of this city comes into possession of the plant of the former Liberty Manufacturing Co. in Longbrook Avenue, Stratford, adjoining tracks of the New Haven railroad. The financial consideration involved is reported as being approximately \$50,000.

It is understood that the concern, whose trucks have now been on the market for several years, will begin installing machinery and making plans for production at the new plant. W. T. MacFarlane is at the head of the Bridgeport truck company.

Men of the Industry and What They Are Doing

Henderson Rejoins Martin-Parry

R. P. Henderson has been appointed general sales manager of the Martin-Parry Corp. of York, Pa. He was one of the organizers of the Cole Motor Car Co. of Indianapolis and later built the Henderson car. In 1916 Henderson became associated with the Parry Manufacturing Co. in Indianapolis as general sales manager. He was identified with the company when the consolidation of the Martin Buggy Co. and the Parry Manufacturing Co. took place in 1918 and was elected vice-president in charge of sales. Following a brief rest last year he has resumed his connection with the company.

Chancellor Assists Henderson

T. E. Chancellor has been appointed assistant general sales manager of the Martin-Parry Corp. of York, Pa., of which R. P. Henderson is general sales manager. Chancellor was a Proctor & Gamble salesman in 1912 and served in that organization in various capacities until December, 1920, when he joined the Martin-Parry Corp. as sales manager of the Texas branch.

Jehle With White Company

Ferdinand Jehle, who for some years has been employed in research and related work for Aluminum Manufacturers, Inc., has severed his connection with that concern and now holds the position of research engineer of The White Co.

Nelson in Development Work

A. L. Nelson, formerly chief engineer of the Premier Motor Corp., who severed his connection with that company on Nov. 30, has since been engaged in development work on a type of constant clearance piston, and in the design of camshafts and valve springs for certain well known makes of cars.

Conner Has New Post

Joseph W. Conner, for seven years sales manager of the Pilot Motor Car Co. of Richmond, Ind., has resigned to become retail sales manager of the Leyman-Buick Co. of Cincinnati with which he was connected as wholesale manager prior to joining Pilot. No successor to Conner has as yet been appointed by the Pilot company.

Hoag Manages Ditzler Color

E. R. Hoag has been appointed general manager of the Ditzler Color Co. and will hold this office jointly with that of vice-president, T. W. Connor, formerly president and general manager, relinquishing the latter office. Hoag will be succeeded as sales manager by Kirke W. Conner, who will hold this office together with that of secretary. Lawrence Du-

Bey will succeed to the office of factory manager, having formerly been production manager, and will be succeeded in this latter capacity by W. T. Utley, who likewise is treasurer. The Ditzler company manufactures painting materials exclusively for the automotive industry and has made the reassignments of offices because of expansion of business.

Earle Joins Huck Axle

John H. Earle, at one time connected with the Parish Manufacturing Corp. and until recently sales manager of the American Die & Tool Co. of Reading, has severed his connection with the latter concern and will assume charge of sales for the Huck Axle Corp. of Chicago.

Snyder in Tool Business

Clarence Snyder, formerly factory manager for Hinkley Motors, Inc., has engaged in the tool business under the firm name of Siewek & Snyder Tool Co. with headquarters in Detroit.

Hough Export Counsellor

B. Olney Hough, former editor of the *American Exporter*, has established himself as export counsellor, consultant and adviser to banks, exporters and manufacturers, with offices at 17 Battery Place, New York.

Dudley Goes with Agency

Lynn B. Dudley, advertising manager of the Federal Motor Truck Co. for the past seven years, has joined the advertising organization of Campbell, Trump & Co. of Detroit, as secretary. Dudley started with the Campbell-Ewald Co. in 1914, going from there to Federal. He has been on the advertising committee of the National Automobile Chamber of Commerce for three years, being the only truck representative on that committee.

Willard G. Myers Has Own Agency

Willard G. Myers, formerly general manager of the United States Advertising Corp. of Toledo and previous to that manager of the advertising service bureau of the Class Journal Co.; Sterling Beeson, formerly of the United States Advertising Corp., and Nora H. Golden, formerly of Lane Bryant, Inc., New York, have organized Myers-Beeson-Golden, Inc., with offices in the Nasby Building, Toledo, and the Pershing Square Building, New York.

MOON'S SECOND BEST MONTH

ST. LOUIS, March 7—February sales are reported by the Moon Motor Car Co. to have been greater than the combined business for the first five months of 1922. The month was the second largest in the history of the company.

Transport Leaders Prepare for Survey

Definite Plans Will Be Made at Meeting of Committee to Be Held in New York

WASHINGTON, March 6—Definite plans as to the scope of the inquiry into motor transport and other phases of the transportation inquiry will be made about March 15, when the committee to be placed in charge of this work meets in its first executive session in New York City.

The personnel of the committee has not been completed, but it is understood that the chairman will be an official of the General Motors Corp.

No marked departure in methods of inquiry has yet been suggested. It is the purpose of this special committee to obtain detailed facts and figures by which the general committee may arrive at conclusions covering correlation of highway transport, railways and waterways.

It is expected that the study will be more far reaching than the transportation investigation by the Joint Commission on Agricultural Inquiry of the Sixty-seventh Congress. The committee will follow many of the recommendations of that commission. In particular it will deal with the commission's suggestion that "the question of relationship between railways, waterways and highways should be subjected to a rigid analysis in order to determine the economic value of each, and all three should be tied together in as close coordination as possible."

The Agricultural Commission deplored the fact that "no data exist upon which conclusions as to the sphere of motor transport in our national system of transportation can be predicated. Moreover, very little data exist as to the relative cost of motor and rail freight transport."

Economist Sees Need of Survey

The study conducted by Prof. J. Gordon McKay, highway economist of the Bureau of Public Roads, based on the Connecticut motor traffic census, showed that the many problems involved indicate that nobody can determine "the ultimate sphere of motor-truck operation without making a study of the entire field of motor-truck transport."

One of the basic ideas back of this joint inquiry is the recognition for eliminating economic waste. Instead of being confined to the agricultural angle as was the case of the Joint Commission on Agricultural Inquiry, this investigation is aimed to cover the industrial field as well.

Rubber Commission Reports U. S. Views

British Growers Hear That America Wants Stable Prices and Assured Supply

NEW YORK, March 7—American consumers of crude rubber want stable prices; they want assurances of a supply that will protect them against speculation and price manipulations and they are asking the foreign governments controlling those countries from which the supplies of crude rubber come to promise legislation that will release additional exports more rapidly than present legislation permits in case American consumers find the supplies running short of the demand.

This is the gist of the report made to the Rubber Growers' Association by the British Commission which recently visited this country to investigate the American industry's needs and listen to American protests on the Stevenson restriction act.

This summary has been cabled over by H. Stuart Hotchkiss, chairman of the special committee of the Rubber Association of America, which conferred with the Englishmen on their recent visit and who now is in London.

Hotchkiss Summarizes Report

As cabled by Hotchkiss, a summary of the British report on the American views of the situation is as follows:

First—There is a general appreciation of the need for the legislative measures taken by the eastern governments.

Second—There is a keen desire to see stability in the price of rubber.

Third—No objection is taken to the level of prices on which exports pivot.

Fourth—There is a definitely expressed fear that the legislation may prove insufficiently elastic to prevent an actual shortage of rubber if America's requirements come up to present anticipations; that if this were to eventuate, speculation and price manipulation would inevitably ensue in a manner most detrimental to the interests of manufacturers and producers alike.

Fifth—Some of the American manufacturers recognize that the general prosperity enjoyed at the present time by their country may be adversely affected by the disorganization prevailing in Europe, and they are generally prepared to admit that if their forecast of American crude rubber requirements proves to be too optimistic any reaction will fall on producers more heavily than on manufacturers. They also recognize that with crude rubber at its present price a substantially larger weight of reclaimed rubber will be used than has been the case during the past eighteen months and that their crude rubber requirements will be proportionally reduced.

Sixth—The Americans feel, however, that they are entitled to ask and they do most strongly urge that a declaration be made by or on behalf of the governments controlling the restriction of exports to the effect that if the legislation at present enacted should prove to be insufficiently elastic to furnish adequate supplies of rubber for the needs of

FOUNDER OF DETROIT GETS BRONZE TABLET

DETROIT, March 7—A bronze tablet in memory of Antone de La Mothe Cadillac, founder of Detroit, was presented to the city yesterday by the Cadillac Motor Car Co. and unveiled on the site of Fort Pontchartrain. H. H. Rice, president of the company, made the presentation speech in the presence of a large group of city officials and residents, and the tablet was accepted by Mayor Lodge.

Following the unveiling a luncheon was given at the Detroit Athletic Club, at which steps were taken for the formation of a permanent Cadillac Society in Detroit.

Henry M. Leland, creator of the Cadillac car and former president of the company, was a noted figure at the ceremonies.

the industry as and when required, steps will be taken by those governments to release additional exports more rapidly than present legislation permits. This request for a declaration has the support of Secretary Hoover of the Department of Commerce at Washington.

The Rubber Association of America, in the absence of a definite expression of policy by the Rubber Growers' Association in the shape of a recommendation to the Stevenson committee or otherwise, has cabled Hotchkiss, urging upon him the extreme desirability of securing a definite statement concerning the action, if any, which will be taken by the Rubber Growers' Association.

St. Paul Unit to Be Ford's Largest West of Detroit

ST. PAUL, MINN., March 5—Henry Ford has told the Greater St. Paul committee that the St. Paul Ford plant will be his largest manufacturing unit west of Detroit. The new plant will begin with one unit, which will produce 700 cars each eight-hour day and parts for 1000 cars in the same period.

Between 4000 and 5000 men will be employed at the start, of which number 3000 will build cars and the rest parts. This staff will be increased year by year until the maximum of 15,000 is reached. Ford will employ surplus farm labor in winter.

The first buildings will occupy approximately thirty acres and will be finished in six months. Powerhouse and dam improvements will be completed in about eight months.

Government Gives Ford Permit

WASHINGTON, March 5—The Federal Power Commission has granted a preliminary permit to the Ford Motor Co. to develop power at the high dam erected across the Mississippi River between St. Paul and Minneapolis by the Government as an aid to navigation.

Armory, Not Palace, for New York Show

Members of N. A. C. C. Vote for Change Because of Need for Greater Space

NEW YORK, March 8—Members of the National Automobile Chamber of Commerce, at a meeting here today, voted to hold the next New York show in the Eighth Coast Artillery Armory located at 193rd Street and Jerome Avenue, the Bronx, thus abandoning the Grand Central Palace at Lexington Avenue and Forty-seventh Street, which has housed the national exhibition for years.

The move has been under consideration for some time, but the outside public has heard nothing of it, General Manager Alfred Reeves and S. A. Miles of the N. A. C. C. show committee reserving their ammunition until today's meeting, when they were prepared to paint a picture to the members on the advisability of switching.

Palace Has Been Outgrown

It is felt that the national show has outgrown the Palace, just as it did Madison Square Garden years ago. It is acknowledged that the Palace is ideal from a location viewpoint, but the lack of space has hampered the growth of the show and prevented exhibitors from securing adequate space for their exhibits. Then, too, the public has packed the Palace at all sessions, and last January, it will be remembered, there were several occasions when the police were forced to shut the doors because of the great crowds inside.

No complaints can be found with the Eighth Coast Artillery Armory as to space, as automobile manufacturers found out in 1920 when the motor truck show was held there in connection with the passenger car exhibition. At that time there were seventy manufacturers exhibiting 288 trucks, and the show was lost in the immensity of the place.

Main Floor 300 by 600 Feet

The armory main floor is 300 by 600 ft., with a clear span from wall to wall, without a post. The building is claimed to be the largest in the world without a post. Besides the main hall, there is a lower room half as large, in addition to large company rooms, a gymnasium and a mess hall that can be used. The main floor has 150,000 sq. ft. net of space as compared with the Palace's 114,000.

While the armory seems a long way from the center of the city, it is pointed out it is only thirty minutes by subway from Forty-second Street, while it can be reached by automobiles over many fine boulevards. It is thought it will be an easy matter to educate the public to going this far to the show, and the N. A. C. C. will start immediately to remove the one objection to the change of location.

FEBRUARY OUTPUT REACHED 271,000

Increase 11 Per Cent Over January Figures

During Same Month of Last Year
120,293 Automobiles and
Trucks Were Produced

NEW YORK, March 7—Directors of the National Automobile Chamber of Commerce, holding their monthly meeting today, were advised by James S. Marvin, chief of the traffic division, that shipping returns place February production of cars and trucks at 271,000, an increase of 11 per cent over January, despite the fact that February was a short working month.

February proved to be the third best production month in the history of the industry; it established a record for carload shipments with 35,700 as against 35,425 in January of this year, and it was the eleventh consecutive month in which production went over 200,000.

Daily Average of 12,318

With only twenty-two working days, February had a daily average of 12,318 motor vehicles, the greatest record on the books, exceeding June, 1922, when the monthly output of 289,000 averaged 11,116 for twenty-six working days, and the 10,111 of August, 1922, when 273,000 vehicles were turned out in twenty-seven days. If February had been a normal month, with twenty-six or twenty-seven working days, the production would have been far in excess of 320,000.

During the month there were 42,670 driveaways, the heaviest in two and one-half years, although not touching the record of 79,000 in one month in 1920. Driveaways showed an increase of 40 per cent over January, due to the weather and the freight car shortage. It is said that there are 10,000 empty automobile cars standing on the rails in Eastern territory which are not being moved because motive power has to be utilized to aid in coal deliveries.

Ford production is said to show about the same increase over January as has the N. A. C. C. production.

M. A. M. A. APPOINTS EARLS

NEW YORK, March 5—The appointment of W. F. Earls as a member of the foreign trade committee of the Motor and Accessory Manufacturers Association was announced here today. Earls is export advertising manager for the United States Rubber Co., and his appointment completes the membership of

INDUSTRY ESTABLISHED NEW PRODUCTION MARK FOR CARS AND TRUCKS LAST MONTH

NEW YORK, March 7—Shipping figures compiled by the National Automobile Chamber of Commerce place February production of cars and trucks at 271,000, compared with 122,366 in February, 1922, a gain of 125 per cent. The best previous February was 180,000 in 1920. Compared with January this year, February shows an increase of 11 per cent.

The following table gives the statistics for January and February and for the months of 1921 and 1922:

	Output 1923	Carloads			Driveaways			Boat		
		1921	1922	1923	1921	1922	1923	1921	1922	1923
January	240,903	6,485	15,357	33,900	3,185	7,479	31,400	93	143	800
February	271,000	9,986	19,636	35,700	7,507	10,173	42,760	99	180	900

Factory shipments for the other months of 1921 and 1922 and output for 1922 follow:

	Output 1922	Carloads		Driveaways		Boat	
		1921	1922	1921	1922	1921	1922
March	172,720	16,287	27,753	9,939	16,917	75	560
April	219,558	20,187	31,334	14,197	22,381	1,619	2,960
May	256,219	18,608	33,416	15,193	28,827	2,381	7,406
June	289,011	20,269	34,230	18,834	33,857	3,947	7,737
July	245,414	19,514	29,116	15,533	28,100	3,726	7,030
August	273,425	20,758	32,814	15,218	36,754	3,595	10,096
September	205,784	19,002	25,950	13,840	30,055	2,959	8,002
October	238,514	17,608	26,980	12,971	33,320	2,226	7,040
November	235,854	14,264	27,232	10,528	27,376	1,402	5,070
December	226,556	12,100	26,900	7,500	27,500	134	1,300

the committee, the organization of which was announced several weeks ago. The committee will hold its first regular meeting within the next week or ten days and get its active work under way at that time.

Production of Plants Is Exceeded by Demand

(Continued from page 587)

production in totals ranging from 600 to 750. Hudson-Essex will build upward of 300 a day. Hupp, Paige-Jewett will produce upward of 150. Olds and Oakland schedules are about 125. Reo is building about 125 in speed-wagons and cars.

Cadillac and Packard, in the high-price lines, are approximating 100 daily, the former slightly over this figure, the latter slightly under. Columbia has a schedule of 75 daily in March. Durant schedules are for 250 Stars and 50 Durant fours. Gray is building about 100. Dort production is ranging from 50 to 75. Rickenbacker will build 45 daily in March and increase this total in April.

HARLEY FOUNDRY BEING SOLD

SPRINGFIELD, MASS., March 7—Sale by the Hendee Manufacturing Co. of the Harley Co. foundry to the Arcade Malleable Iron Co. of Worcester is under way. It will be used for making malleable iron and aluminum castings. The Hendee Co. retains the drop forging plant.

Forsyth Plant to Become Important Output Center

CHICAGO, March 7—The Motor Wheel Corp. announces that it is planning to develop its recently acquired plant of the Forsyth Brothers Co. at Harvey, Ill., near Chicago, into one of the most important production centers for all three types of steel wheels controlled by the company, which include the Tuare, Disteel and Forsyth.

The present capacity of the Forsyth plant, according to C. C. Carlton, secretary of Motor Wheel Corp. is 5000 sets of steel wheels a day, or more than 5,000,000 wheels a year. Carlton states that this capacity will be increased as rapidly as advisable.

PULSIFER ADDRESSES S. A. E.

DETROIT, March 3—L. V. Pulsifer of the Valentine Varnish Co. presented a paper before the Detroit Section of the Society of Automotive Engineers here last night. In this paper he spoke of the necessity for a carefully engineered paint structure.

PIERCE BUSINESS INCREASED

BUFFALO, March 6—In the last six months of 1922 the passenger car business of the Pierce-Arrow Motor Car Co. increased 70 per cent over the first half of the year, and 53 per cent over the last six months of 1921. Current truck business at the present time shows a 56 per cent increase over 1921.

Last Month's Sales Gained 100 Per Cent

Excellent Prospects for March and
April Reported at N. A.
C. C. Meeting

NEW YORK, March 8—February sales were 100 per cent better than January while the prospects for the following two months are excellent, was the report made to the directors of the National Automobile Chamber of Commerce at their monthly meeting here.

The demand for closed cars still keeps up. Out in Los Angeles the sales of closed cars run at 35 per cent, the smallest in the country, but in Cleveland they are up as high as 75 per cent, while in South Dakota the figure reaches 85 per cent.

The used car situation is improving somewhat, while a substantial improvement in the truck business is reported generally, with the exception of Iowa and Kansas.

Harvey Firestone addressed the directors on the rubber situation and asked for the support of the chamber in his efforts to have the United States conduct a survey to discover if it is possible for this country or its possessions to produce rubber. The directors took the matter under consideration.

The chamber also decided to conduct a survey of the demand for magnetos on cars sent to foreign countries.

Resolutions were passed on the deaths of Charles Thaddeus Terry, who had represented the industry in a legal way for twenty years, and William MacGlashan of the Studebaker Corp., who was a member of the N. A. C. C. patent committee.

Following the directors' meeting yesterday there was a general meeting of members of the N. A. C. C. today. The morning session was featured by the presence of Secretary Hoover of the Department of Commerce, who discussed the present condition of the industry. In the afternoon there was a general meeting of the truck members of the chamber.

Ford Almost Doubled Truck Sales in U. S.

DETROIT, March 5—Sales of trucks in the United States last year by the Ford Motor Co. almost doubled business in 1921, and statistics gathered by the factory show a more extensive service in all classes of transportation than ever before. Trucks built in the American plants of the company totaled 133,564 in the year just closed, as against 64,796, some of these, however, being produced for export to countries not served by the foreign plants.

Foreign and Canadian plants also showed increased truck production and sales, the Manchester, England, plant building 11,130, all of which were ab-

sorbed in the British Isles, and the Canadian plant, 6645 for the domestic trade in the Dominion. Canadian business in 1921 was 4208. Total trucks built in all foreign plants in 1922 was 20,475, the largest part going to the British Isles, Canada and the British possessions served by the Canadian plant.

Truck production in the first month of this year was 13,502 in all plants, an increase of 100 per cent over the same month a year ago. The company looks for continued steady progress during the year in the light truck industry, basing this on the encouraging forecast for general business during the year.

Current Assets of Hayes Wheel Placed at \$703,875

DETROIT, March 7—The annual report of Hayes Manufacturing Co. issued this week shows profits in the last four months of the fiscal year ending Dec. 31 of \$88,521 on sales of \$851,198, which compares with a loss of \$8,311 in the preceding six months on approximately the same amount of business.

With other income, earnings in the last four months were at an annual rate of \$275,931, equal to \$1.47 on common stock after allowing for an 8 per cent dividend on the 6791 preferred shares outstanding. The company has orders approximating \$1,000,000.

Current assets total \$703,875, of which \$247,689 is in cash and receivables and \$446,917 inventories. Total assets are \$1,852,874. Current liabilities total \$390,532, and the surplus, representing book value of 150,000 shares of common stock, totals \$665,531.

Vesta Battery 1921 Sales Exceeded by 35 Per Cent

CHICAGO, March 8—The report of the Vesta Battery Co. for the year ended Dec. 31, 1922, shows net income from operations of \$48,318 and income from other sources of \$31,497, which after losses from discontinuing unprofitable branches was reduced to a deficit of \$6,572.

Profit and loss surplus was reduced to \$39,186 after paying dividends of \$32,614. In 1922 sales of batteries were 35 per cent greater than in 1921, but prices were lower. At the present time, however, sales both in dollars and units are well ahead of the same period last year.

Lee Rubber Net Profits in 1922 Totaled \$370,493

NEW YORK, March 7—The report of the Lee Rubber and Tire Corp. for the year ended Dec. 31, 1922, shows net profits of \$370,493, after charges and Federal taxes, equivalent to \$2.47 a share on the 150,000 shares of no par common stock, compared with net profits of \$9,238, or 6 cents a share, the previous year.

Net sales for the year amounted to \$6,468,208, as against \$7,358,436, while expenses stood at \$6,095,528.

Stearns to Produce New 4-Cylinder Car

Will Be Lower in Price Than Old
—Work Is Being Started on
Additional Plant

CLEVELAND, March 7—The F. B. Stearns Co. will bring out a new four-cylinder model which will be considerably lower in price than the present four-cylinder car. This will affect in no way the production of the present six which was brought out in July of last year.

The plans are for a considerably higher production and, with the lowered cost, it is expected that this can be accomplished. It is understood that the engine in the new four will be substantially the same as in the present model, the changes being in the chassis.

In order to provide for the production of the new model, President Brooker has announced that work will begin today on the construction of a fireproof building immediately west of the present plant. The building will be two stories, 300 ft. by 200 ft.

Work on the new car has been going on for some time, and it is so well advanced that the company will begin production on it by July 1. The management will follow the usual policy, and all parts will be made in the Stearns factory.

Plan for Meeting Cost

It is expected that the new factory and equipment will cost approximately \$600,000. The stockholders have been asked to meet April 9 to consider two proposals for raising the necessary funds: 1—An increase in common stock from 190,000 to 260,000 of no par value, or such other amount as may be agreed on; 2—The issuance of notes not to exceed \$1,400,000 in such form as may be approved.

Proceeds of the proposed financing will be used to pay the expense of the expansion program and to purchase raw material for the new car.

The new structure will give the company a building frontage of 636 feet on Euclid Avenue and a depth of 465 ft., and two acres of land not covered by buildings and facing a railroad that will be held in reserve. The business of the company in January, February and March is reported as the best in the history of the company for corresponding months.

LEWIS HALL MOTORS SOLD

DETROIT, March 7—Lewis Hall Motors Corp. was sold at a bankrupt sale this week, the real estate being bought in by the Bank of Detroit, and the inventory and equipment being sold in parcels to a number of smaller buyers.

The sale prices will be submitted for confirmation in the Federal Court.

Less Steel Allowed for Car Production

Said to Be Due to Tin Plate Needs
—Stocks in Automobile
Plants Run Low

(Continued from page 586)

new business for steel products in Pittsburgh and also are unable to buy plate glass here. The scarcity of the latter, it is said, will cut down the output of automobile plants.

Gradual Shortage in Detroit

DETROIT, March 6—Inability of steel mills to report maximum production through an insufficient labor supply and other causes is bringing about a gradual shortage of stocks in automobile plants, which will reach a crisis in April unless some means are found to meet the situation.

Car manufacturers and parts makers declare the outlook is dark and express the fear that no way out of the dilemma will be found in time to avert sharp curtailment in manufacturing schedules at the peak of the spring season. There are no stocks of steel of any size in any of the plants, due to the fact that the steel mills have been pressed with orders since Dec. 1 and have been unable at any time since then to give factories much more than enough for current requirements.

With factories now only breaking even on steel, there will be shorter production in March than February, and April is expected to run 10 to 15 per cent less than the present output. This is due to labor diversion to outdoor employment.

The general feeling is that the industry is getting its percentage of steel being produced. Not much credence is placed in reports that sheet steel rollers may be given over to tin plate production for the canning industry. There is more money in automobile steels than in tin plate, and automobile men do not believe profits will be willingly sacrificed.

Believes There Is Discrimination

One of the largest buyers of sheet steel said he thought the automotive industry was being discriminated against in favor of other industries, and said that this was being done deliberately by steel builders to keep the industry from running wild. If this was the intention, he said, they are acting wisely, because there is a decided tendency in some quarters of the industry to slip back into the wild buying days of 1919.

This particular company is getting enough steel for its requirements by scattering its buying over eighteen plants, but how long it will be able to continue doing so is problematical.

Prices of sheet steel, as fixed March 1 for the next three months, are regarded as entirely fair in the industry and warranted by conditions in the raw material, labor and railroad fields. There is no

PRICES OF MATERIAL SHOW UPWARD TREND

DETROIT, March 6—Commenting on the present situation in the industry, Alvan Macauley, president of the Packard Motor Car Co., says:

"Higher automobile prices, if they come, will be forced by improving industrial conditions, of which there now is no doubt. Steel, iron, aluminum, copper, leather, rubber and all the other principal materials show a marked upward trend which promises to be of some duration. But the critical factor, particularly in steel, is deliveries, which can be obtained only by the payment of premiums.

"The automobile industry as a whole is showing admirable caution in not overbuying for long terms ahead. It is not risking high priced inventories in a doubtful market again. But neither can automobile manufacturers risk the halting for one moment of production schedules—so they must have a constant stream of material flowing into their plants. Labor, too, is showing increasing employment as business improves, and wage increases are being reported more and more frequently."

tendency to take advantage of the situation by boosting prices, executives declare, because the steel industry is desirous of keeping markets open by stabilizing prices and knows that this cannot be accomplished in the face of steady advances.

At least eight of the largest mills in the country are working exclusively on sheets and have been attempting every month to reach maximum operations. Detroit purchasing executives say, but, in spite of their utmost efforts, they have been checked each month by recurrences of labor, material or railroad difficulties, so that at no time have they been able to exceed 80 per cent of capacity.

FORD SALES IN FEBRUARY

DETROIT, March 7—Retail sales of the Ford Motor Co. in February totaled 116,080.

Table of Imports and Reimports of the Automotive Industry for November, 1922, and Eleven Months of the Year

IMPORTS	Nov., 1921		Nov., 1922		Eleven Months Ending Nov. 30			
	No.	Value	No.	Value	No.	Value	No.	Value
Automobiles and chassis..	37	\$57,622	56	\$67,284	498	\$831,467	419	\$693,480
Other vehicles and parts								
for them (a).....	188,398		86,916		1,125,988		676,252	
REIMPORTS								
Amount of duty collected ..								(b)45,000
Automobiles (free of duty)126	194,290		282	334,332	3,428	5,453,234	1,661	2,659,060

(a) Under the new classification by the statistical division of the Department of Commerce, this includes bodies, parts of except tires, aircraft, bicycles and parts except tires, motorcycles and parts except tires, motor boats and parts, railway cars and parts, carriages, drays, trucks and parts.

(b) From Sept. 22 to Nov. 30, under the new tariff bill, the duty on reimports is 90 per cent of their value—this figure revised from last month. There were no taxable imports during November.

Standard Increases List; Has New Model

Open Cars Are Now Quoted at
\$2,500 While Price of Sedan
Is Set at \$3,400

BUTLER, PA., March 6—An increase of \$105 in prices on the open models and \$200 on the seven-passenger, sedan is announced by the Standard Motor Car Co. The new prices on the Standard car, now known as Model "99" instead of "98," as heretofore, are as follows:

	Old Price	New Price
4-pass. sport.....	\$2,395	\$2,500
7-pass. phaeton.....	2,395	2,500
7-pass. sedan.....	3,200	3,400
4-pass. sedanette.....		3,300
4-pass. toursedette.....		3,600
7-pass. vestibule sedan..		3,500
Town car.....		5,500

Both the two-passenger roadster and the four-passenger coupe have been discontinued.

Prices of Full Line Cut by United States Truck

CINCINNATI, March 6—The United States Motor Truck Co. announces price reductions affecting practically its entire line of trucks. The list shows reductions ranging from \$200 on the lighter models to \$650 on the heavier types, and is as follows:

Model	Old Price	New Price
U 1 1/4 Ton	\$1,800	\$1,575
N 1 1/2 Ton	\$2,175	\$1,775
NW 23 1/2-2	\$2,375	\$2,175
R 2 1/2-3	\$3,300	\$2,675
S 3 1/2-4	\$4,075	\$3,425
S Special 4-5	\$	\$3,725
T 5-7	\$4,675	\$4,475

Bethlehem Lists Prices from \$190 to \$490 Higher

ALLENTOWN, PA., March 6—The Bethlehem Motors Corp. has announced an increase in the prices of its three models, ranging from \$190 to \$490. The new prices are as follows:

Model	Old Price	New Price
KN 1-Ton	\$1,195	\$1,385
GN 2-Ton	1,795	2,185
HN 3-Ton	2,495	2,985

FINANCIAL NOTES

Paige-Detroit Motor Car Co. has declared a dividend of 2½ per cent on its \$4,000,000 common stock, payable April 2 to stockholders of record March 20. This is the first dividend authorized since the payment of a 100 per cent stock dividend in December. Current earnings, it is reported, are running close to \$10 a share on the \$4,000,000 outstanding common, compared with \$10.51 a share on the \$2,000,000 outstanding common earned in 1922. The company plans a production of 25,930 cars for the first half of this year.

Stromberg Carburetor Co., Chicago, has declared a quarterly dividend of \$1.75 a share on its capital stock, thereby increasing the annual rate from \$5 to \$7. The dividend is payable April 2 to stock of record March 19. The company reports that for the three months ended Dec. 31, 1922, net profits were \$225,546 after charges and taxes, equivalent to \$3 a share on the 75,000 shares of no par capital stock outstanding.

McCord Radiator Manufacturing Co. class A common stock to the number of 50,000 shares is being offered by a banking syndicate at \$37 a share. It is intended to place this stock immediately on an annual dividend basis of \$3 a share, payable quarterly. The company is a unit of the McCord Manufacturing Co. of New York, manufacturing radiators, gaskets and lubricators.

Moline Body Corp. of Moline, Ill., is offering an issue of \$300,000 first mortgage 7 per cent sinking fund gold bonds maturing in sums of \$30,000 annually from March 1, 1924, to March 1, 1933. The company's statement in support of the issue asserts that on Feb. 1 it had on its books orders that would keep the plant running at capacity until July 1, 1923.

Hayes Manufacturing Co. has declared a dividend of 1 per cent on the preferred stock, payable March 15 to stock of record Feb. 28. On Feb. 15 a dividend of 1 per cent was paid on the preferred. The accrued dividends on the preferred stock from Nov. 1, 1920, to Dec. 31, 1922, amount to \$117,710.

United States Axle Co., Pottstown, Pa., manufacturer of axles and other parts for automobiles, will float through banks in that city \$200,000 twenty-year 6 per cent convertible gold bonds, in order to provide for plant expansion.

Mack Trucks, Inc., has declared the regular quarterly dividends of \$1 a share on common stock and \$1.75 a share on both first and second preferred stocks, all dividends payable April 1 to stock of record March 20.

Reo Motor Car Co. has declared an extra dividend of 1 per cent and the regular quarterly dividend of 1½ per cent, both payable April 2, to stockholders of record March 15.

Kelly-Springfield Tire Co. has declared the regular quarterly dividend of 1½ per cent on the 6 per cent preferred stock, payable April 2 to holders of record March 15.

AUBURN'S CURRENT ASSETS

NEW YORK, March 5—Current assets of the Auburn Automobile Co. were erroneously given as \$191,891 in the Feb. 22 issue of *AUTOMOTIVE INDUSTRIES*, summarizing the company's annual financial statement.

The figure quoted represented only the company's cash in bank and was but a

small portion of the current assets, the total of which amounted to \$1,405,910, including the following principal items: United States Treasury notes, \$203,062; accounts receivable, \$419,673; and inventory, \$581,466. Current liabilities were \$131,844.62.

Month Is Moving Along on Increased Schedules

(Continued from page 586)

report some difficulty in keeping their supplies to a comfortable level and see no marked relief possible until freight cars now used in the transportation of coal, particularly in the East, can be diverted to centers supplying automotive needs. This condition was forestalled somewhat by early purchasing, but improvement in the rail situation has not kept pace with the continued heavy operations at automobile producing plants.

Parts makers are forging ahead on expanded programs with large business forecast through the spring months. As with car producers no prediction of the volume of orders beyond the beginning of summer is made. Collections continue entirely satisfactory.

Truck Building Shows Increase

As compared with a year ago truck builders report a 50 per cent increase in production and the outlook for greater business particularly bright. The conditions that existed in the truck market a year ago are absent this year and there is apparent a more encouraging attitude among prospective purchasers. During the last thirty days there has been a pronounced forward movement in this branch of the industry with the consequent advancement of manufacturing schedules.

Tire makers report the maintenance of operations on increasingly high schedules.

Goodrich Report Shows \$93,649,710 Net Sales

AKRON, March 6—Net sales of \$93,649,710 against \$86,687,339 in the previous year are shown in the annual report for 1922, filed by the B. F. Goodrich Co.

Profits from operations last year totaled \$7,018,546 against a loss of \$76,670 in 1921, the report says. Net profits, after all charges for depreciation, interest and other accounts, were \$3,047,769, which, after preferred dividends, was equal to 73 cents a share on 601,400 shares of no par value preferred stock outstanding.

After deductions for depreciation, interest, etc., in 1921 there was reported a deficit of \$8,983,401.

BANK CREDITS

Written exclusively for *AUTOMOTIVE INDUSTRIES* by the *Guaranty Trust Co.*, second largest bank in America.

The raising of the discount rate of the San Francisco Federal Reserve Bank from 4 to 4½ per cent, following like action by the New York and Boston Reserve banks a few days earlier, for the first time brings the discount rate for all twelve Reserve banks into uniformity.

It is significant that an enormous expansion of industry and trade has taken place with comparatively little increase in bank loans. In fact, prior to July, 1922, loans by reporting member banks of the Federal Reserve System and rediscounts by the Federal Reserve banks continued to decline, although business was generally on the upgrade.

As business improved and commodity accumulations were liquidated, the paying off of old loans exceeded new borrowings in volume. And since last summer increases in these loans and discounts have been moderate in comparison with the rate of increase in business activity.

There are various indications that the present rate of industrial production is not far from that reached at the peak of the post-war expansion in 1920. The percentage advance in the Federal Reserve Board's index of production in basic industries, corrected for seasonal variation, from July, 1922, to January, 1923, was more than three times the increase in loans and discounts of member banks.

The statement of the Federal Reserve banks as of Feb. 28 showed a slight decline in reserves for the week.

The range of call money rates last week was somewhat below that of the previous week, while time money ruled firm at 5 per cent, and the prevailing rate for prime commercial paper remained at 4¼ per cent.

Automotive Association Chooses Van Cleef Head

CHICAGO, March 3—An enlarged program of merchandising cooperation is planned by the Automotive Manufacturers Association, following the election of new officers and directors.

The election resulted as follows: President, Noah Van Cleef, Van Cleef Bros., Chicago; vice-president, Franklin Mayo, Mayo-Skinner Manufacturing Co., Chicago; treasurer, James T. Greenlee, Imperial Brass Manufacturing Co., Chicago; directors, Frank Parizek, C. D. Pettingell, James Nealyon, H. S. Pardee, C. J. Buckwalter, B. H. Lancaster, H. E. Patterson, L. W. Golder and A. C. Johnson, all of Chicago; G. F. Disher and C. H. Hathaway, Milwaukee and W. G. Pancoast of Waukegan, Ill.

Exchange of information regarding domestic and foreign sales opportunities is one of the activities of the association, and the plans of Van Cleef contemplate extension of activities that will aid in developing the sales of the member concerns.

California Roused by Fuel Situation

Legislative Committee Investigating Price and Quality of Gasoline Used There

LOS ANGELES, March 5—Oil companies and gasoline producers have drawn the fire of a legislative committee in this State. Quality and prices are receiving attention. The committee is holding hearings in different localities and will be prepared to make a report during the second half of the session.

Another movement on foot and strongly supported by some members of the Legislature is to declare the oil companies public utilities and require that their operations be controlled by the Railroad Commission.

Some of the questions in which the investigating committee is concerned are: Why has gasoline been sold in California, where it is produced, cheaper than in neighboring States; why have gasoline distributing companies inaugurated a coupon book system of sales and differentiated between classes of buyers by giving price reductions; why is oil being taken from sump holes, processed and sold at the same price that is charged for first quality oil; why is this practice extended even to reclaiming waste oil obtained from garages and elsewhere; why has distribution become so intense that there are as many as three competing stations at one street intersection and could not a more economical method of distribution be brought about, which would result in price reductions to consumers?

It is claimed that the movement to declare oil companies public utilities is the result of some of the companies' methods of doing business. It is pointed out pipe lines are supposedly common carriers, but some companies refuse to take oil into their lines produced by other companies.

La Follette Committee Expects Dollar Gasoline

(Continued from page 590)

view here, declared that such a prediction is misleading and liable to create a false and mischievous impression.

Teagle said:

As illustrative of the competitive conditions in the industry, it may be mentioned that on Jan. 1 of this year there were operating in the mid-continent area 126 refineries, which were turning out, together with the producers of natural gasoline, 32 per cent or one-third of the total gasoline requirements of the United States. Of 85,000 barrels of gasoline now being produced every day in the midcontinent territory, approximately 60,000 barrels are being thrown into the markets that offer the best returns. The combined production of the refineries of the Standard Oil Co. (N. J.) is 32,000 barrels daily.

It is a fact too patent to require elabora-

tion that the refiner on the Atlantic seaboard or elsewhere cannot hold up an arbitrary price for gasoline or other petroleum products when any jobber can draw upon this big surplus in the mid-continent area at prices lower than those asked by the eastern refiner. It is not true that the Standard Oil Co. alone or in cooperation with other companies fixes the price of oil as charged in the report. There is absolutely no price-fixing whatever, except that which results from the laws of supply.

INDUSTRIAL NOTES

Precision & Thread Grinder Manufacturing Co., Philadelphia, has appointed the following firms to act as foreign representatives: A. R. Williams Machinery Co., Ltd., Toronto, and Williams & Wilson, Ltd., Montreal, for Canada; Allied Machinery Co. of America, for France, Belgium, Switzerland, Italy and Spain; V. Lowener, for Norway, Sweden and Denmark; Andrews & George Co., for Japan; M. Mott Engineering Co., for Petrograd and Moscow; R. S. Stovis & Sons, for Holland and the Dutch East Indies; Bohm & Bornmann, for Berlin, and Bevan & Edwards, for Melbourne, Australia.

Ranney-Weaver Co. has been organized for the purpose of operating Cleveland sales offices for the Erie Malleable Iron Co., the Fedders Manufacturing Co., Inc., and the Weldless Tube Co., with headquarters in the Leader-News building. The organizers are E. C. Ranney, for more than twenty years director of purchases for the Winton Co., and O. L. Weaver, at one time Overland and Pierce-Arrow distributor in Cleveland territory and for at least five years vice-president and sales manager of the Star Rubber Co.

Murray Tire Co. of Birmingham, Ala., has purchased a factory in that city for the manufacture of cord and fabric tires. It is a closed corporation and no stock or securities are being offered for sale. The owners are R. C. Murray, president, and Lynne Carl. The company started in business several years ago as a tire distributor, and in that period has established stores in many of the chief cities through the south.

Roos-Bellanca Aircraft Co. has been incorporated at Omaha with a capitalization of \$250,000 dollars to produce the Bellanca airplanes. The officers of the company are: Victor H. Roos, president; A. V. Drescher, vice-president; C. W. Pollard, secretary; Henry Rohlf, treasurer, and A. H. Fetter and G. M. Bellanca, designer of the plane, directors.

Rubber Products Co. of Barberton, Akron suburb, has abandoned the manufacture of pneumatic tires and is devoting its entire factory energy to the manufacture of an extensive line of rubber sundries. The company was making about 500 tires daily.

Grand Rapids Tire & Rubber Corp. stockholders have voted to change the name of the concern to the Corduroy Tire Co.

TIMKEN BEARINGS EXPANDING

CANTON, OHIO, March 6 — The Timken Roller Bearing Co. is making provision for a considerable increase in the production of bearings at both its local and Columbus plants. At the plant in this city a large modern factory building is now in process of construction, on which work is being rushed to completion as rapidly as possible.

METAL MARKETS

Two different kinds of premiums are in evidence in the steel market, of which the contest between consumers for nearby and second quarter shipments continues to be the outstanding feature. Ordinarily, whatever price a consumer pays over and above the lowest quotations in the market is looked upon as a premium. The lowest quotations in the market today are those of the chief interest. These have recently been revised upward in so far as sheets are concerned; but, despite this, upward revision means nothing, as the Corporation's sheet-rolling subsidiary is booked solid into midsummer, and, therefore, has no sheets for sale.

The revised quotation of the leading interest for full-finished automobile sheets is 5 cents, base. Independent specialists in this class of sheets began booking second quarter orders for automobile sheets a few days ago on a 5.35 cents basis, or \$7 per ton higher than the Corporation's quotation. To characterize this \$7 differential as a premium is misleading because 5-cent automobile sheets are unobtainable. On many steel products bought by automotive consumers, premiums of a different character are being paid. This is true of steel bars and strip steel.

Producers of the latter, for instance, have been facetiously said to be dodging buyers of late. What they are doing in fact, however, is to permit consumers who are not protected by contracts and who need material urgently to set the pace. They have a nominal quotation, but at that level they have no steel for sale. There being thus no "asked" price, the criterion of the market is the "bid" price; and this level not being uniform, more nearly involves what may actually be called the payment of premiums. For early shipment of modest tonnages of cold-rolled strip steel, these premiums range all the way from \$5 to \$10. Leading steel market interests are now thoroughly alive to the possibility of runaway price conditions, with all their vicious consequences. So far this menace lies in the future.

With the sold-out condition of the mills of that market factor which has always taken the lead in repressing undue price advances, any strenuous clamping down of the lid on prices at this juncture is out of the question. It is among the independents, however, that moderation to the extent permitted by conditions is beginning to make itself felt. Stabilization at near the now actually prevailing price levels is more likely to ensure a continuity of the demand commensurate with the present rate of production.

Pig Iron.—Silvery iron is in good demand by automotive foundries, and all of the markets report continued inquiry from the automotive trade for malleable and foundry. While the tendency of the market continues upward, melters are buying conservatively. Some automotive foundries are sounding the market with reference to third quarter supplies.

Aluminum.—The supply in the "outside" market has diminished to a considerable extent.

Copper.—With 17 cent copper and copper and brass products on a proportionate price basis, consumers' demand and interest are showing signs of abatement. There are those who now recall that leading producers some time ago ceased publication of monthly output records, and estimates indicate a steady increase in production. In the absence of official figures, these estimates, right or wrong, are naturally given due consideration.

Calendar

SHOWS

May 13-20 — New York, Spring Salon, Hotel Commodore.
Nov. 4-10 — New York, First Automobile Salon of the Foreign Automotive Association, Hotel Astor.

FOREIGN SHOWS

March 31 - April 29 — Madrid, Spain, International Automobile Exposition at the Palacio de Exposiciones, showing automobiles, motorcycles, accessories and equipment, under the auspices of the Chambre Syndicale de l'Automobile et du Cycle.
May 9 - June 12 — Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.
Oct. 4 - 14 — Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.
Oct. 24-Nov. 2 — Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

RACES

May 10 — Berlin - Grunewald, German Grand Prix.
May 30 — Indianapolis, Eleventh Annual 500-mile International Sweepstakes.
July 2 — Tours, French Grand Prix 500-mile race.

CONVENTIONS

May 2, 3, 4 — New Orleans, Annual Convention of the National Foreign Trade Council.
May 7-12 — Seville, Spain, Fourth International Highway Congress.
May — New York, Annual Convention of the United States Chamber of Commerce.
Oct. 24-26 — Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

S. A. E. MEETINGS

Metropolitan Section
March 15 — Speaker, William P. Kennedy, President, Ken-

nedy Engineering Corp., Subject Possibilities in the Development of the Trolley Bus; Automobile Club of America, New York; Supper 6.30 p.m.; Meeting 8 p.m.

April 19 — Speaker, Edw. E. La Schum, General Superintendent, Motor Vehicle Equipment, American Railway Express Co.; Subject, Engineering Features of Fleet Operation.

May 17 — Speaker, F. P. Gilligan, Secretary, Henry Southern Engineering Co., Subject, Metallic Materials for Automotive Work.

Other S. A. E. Meetings

March 16 — Cleveland Section — Speaker, Col. G. A. Guthrie; Rooms of the Cleveland Engineering Society, Hotel Winton, 8 p.m.

March 16 — New England Section — Speaker, Harry Tipper; Subject, Economic Phase of the Automotive Industry to be followed by a film on electrical starting,

lighting and ignition; Engineers' Club, Boston; Dinner 6.30 p.m.; Meeting 8 p.m.

March 23 — Mid-West Section — Speaker, F. H. Ford; Subject, Road Lighting; Western Society of Engineers; Meeting 7 p.m.

Buffalo Section — Speaker, Edward Schipper; Subject, Impressions of New York and Chicago Shows; Hotel Iroquois at 8 p.m.

Pennsylvania Section — Will Not Meet in March.

June 19-23 — Summer Meeting of the S. A. E. — Spring Lake, N. J.

October — Production Meeting of the S. A. E. — Cleveland.

MEETINGS

June 14-15 — Bethlehem, Pa., Eastern Sectional Meeting of the American Society for Steel Treating, Hotel Reservations made through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem.

Prosperity Enjoyed Through Southeast

ATLANTA, March 6—The monthly report of the Federal Reserve Bank of Atlanta, covering conditions in the Southeast and based on information from larger factories, mills and retail merchants over the district, has just been issued, the summary of conditions evidencing that the Southeast has entered a real period of prosperity with practically all lines of business and industry booming.

Hardly a line of commerce fails to show improvement over the same period in 1922, and in many instances the betterment is 100 per cent and more. Financially, the district is in the best shape it has ever been, the report states, due largely to agricultural prosperity.

Cotton prices in the Atlanta and other Southern markets have climbed above 30 cents per pound, which insures growers an excellent profit. The Georgia Agricultural Department states there will be between 200,000 and 300,000 more bales produced in Georgia this year than last.

Automobile distributors in Atlanta state they have received more applications for dealer franchises the past month from all over the Southeast than during any single month before in the history of the industry in this section. And more new dealer firms were established during February than during any month heretofore in the Southeast.

AUTOCAR EARNED \$451,505

ARDMORE, PA., March 6—The annual report of the Autocar Co., as of Dec. 31, 1922, shows net earnings, after all depreciation and interest, of \$451,505. Net factory sales for 1922 amounted to \$10,800,000, or a gain of \$1,500,000 over 1921. The company states that at the beginning of the year it had on hand

unfilled orders totaling about \$800,000 more than on the same date in 1921, and that during January of this year it booked almost double the volume of orders over the corresponding period of 1922.

OBITUARY

J. C. MATLACK

NEW YORK, March 5—News has reached New York of the death at Long Key, Fla., of J. C. Matlack, long prominent in the rubber industry. Matlack's first connection with the industry was as president of the International A & V Tire Co. of Milltown, N. J., which was succeeded by the Michelin Tire Co., of which he also was chief executive. Later he was closely allied with W. C. Durant in the reorganization of General Motors, after which he joined the Ajax Rubber Co. as sales director.

G. JAHN

NEW YORK, March 5—The death of G. Jahn, treasurer of the Robert Bosch Magneto Co., Inc., is announced. Mr. Jahn was long prominent in the magneto and ignition field, coming from Germany fifteen years ago and helping to organize the Bosch company that succeeded the Simms-Bosch company.

WILLIAM MAC GLASHAN

DETROIT, March 5—William Mac Glashan, consulting engineer for the Studebaker Corp., is dead of pneumonia. Mr. Mac Glashan, a son-in-law of Thomas Henderson of the Winton Co., started his automobile career with Winton, but for several years served as consulting engineer for Studebaker, specializing on patents. He was a member of the patients committee of the National Automobile Chamber of Commerce.

Horse Association in Anti-Truck Move

LOS ANGELES, March 6 — The "Horse Association of America" has begun an anti-motor truck legislative campaign in this State. Members of the Legislature are in receipt of letters purporting to point out the vast increase in the tax "burden" that is "laid on every man, woman and child in this country."

This increase in tax "burden" is assigned as being due in part to the costs of roads and their maintenance. The letter to the legislators advocates that the combined weight of a motor truck and load be limited to ten tons, and that drastic penalties for overloading, or exceeding the speed limit be imposed.

The association evidently is unaware of the fact that before the California Legislature at this time is a bill which would permit the loading of steel-tired vehicles drawn by muscular power to the same limits as are permitted rubber-tired motor vehicles. This bill has been introduced at the instigation of operators of horse-drawn drays.

Collins Reports Arizona as Showing Improvement

CLEVELAND, March 6—R. H. Collins, president and general manager of the Peerless Motor Car Co., has returned from his annual trip to California. With his party, Collins drove a new Peerless from Tucson, Ariz., to San Francisco, touring 2000 miles of desert land to try out the car.

Collins reports that Arizona is rapidly recovering from the economic crisis through which it passed in 1921. Copper is being sold at a price which allows it to be mined at a profit; cotton is selling at high prices and cattle and sheep are improving.